

PACIFIC SEABIRDS



A Publication of the Pacific Seabird Group

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PACIFIC SEABIRD GROUP

Dedicated to the Study and Conservation of Pacific Seabirds
and Their Environment

The Pacific Seabird Group (PSG) was formed in 1972 due to the need for better communication among Pacific seabird researchers. PSG provides a forum for the research activities of its members, promotes the conservation of seabirds, and informs members and the public of issues relating to Pacific Ocean seabirds and their environment. PSG members include research scientists, conservation professionals, and members of the public from all parts of the Pacific Ocean. The group also welcomes seabird professionals and enthusiasts in other parts of the world. PSG holds annual meetings at which scientific papers and symposia are presented; abstracts for meetings are published on our web site. The group is active in promoting conservation of seabirds, including seabird/fisheries interactions, monitoring of seabird populations, seabird restoration following oil spills, establishment of seabird sanctuaries, and endangered species. Policy statements are issued on conservation issues of critical importance. PSG's journals are *Pacific Seabirds* (formerly the *PSG Bulletin*) and *Marine Ornithology*. Other publications include symposium volumes and technical reports; these are listed near the back of this issue. PSG is a member of the International Union for Conservation of Nature (IUCN), the Ornithological Council, and the American Bird Conservancy. Annual dues for membership are \$30 (individual and family); \$24 (student, undergraduate and graduate); and \$900 (Life Membership, payable in five \$180 installments). Dues are payable to the Treasurer; see the PSG web site, or the Membership Order Form next to inside back cover.

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Pacific Seabirds

This journal has published short peer-reviewed articles, reports of ongoing work, conservation news, and other items of importance to conservation of seabirds in the Pacific Ocean. The journal is published twice a year in spring and fall. Materials should be submitted to the Editor, except that conservation-related material should be submitted to the Associate Editor for Conservation. Information for contributors to *Pacific Seabirds* is published in each Fall issue and is on PSG's web site. Editorial policies accord with those of PSG's Executive Council; in other matters the journal aims for an unbiased point of view. Back issues of the *PSG Bulletin* and *Pacific Seabirds* are posted on the group's web site or may be ordered from the treasurer (see Membership/Order Form next to inside back cover for details). Submission deadlines are 20 March for the spring issue and 1 October for the fall issue; manuscripts may be submitted at any time.

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Marine Ornithology

Marine Ornithology presents peer-reviewed contributions concerning international seabird science and conservation. The journal is published two times a year. It is available on its web site (www.marineornithology.org) or by subscription. The journal is supported by a partnership of global seabird societies, including the Pacific Seabird Group (PSG), African Seabird Group, Australasian Seabird Group, the Seabird Group (UK), Dutch Seabird Group, and Japan Seabird Group. For further information see www.marineornithology.org

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THE EDITOR'S CORNER

Volume 40 of *Pacific Seabirds* will be my last stint as Editor. I began the job (“job” should be in quotes, since it’s unpaid!) with Volume 27, in the year 2000. Incredibly, that’s fourteen years.

It has been a superlative experience! It’s allowed me to keep reasonably current with seabird conservation and research, and I’ve enjoyed reading everyone’s yearly reports. I have especially valued my work with individual contributors—authors of articles, regional representatives, and others.

The character of *Pacific Seabirds* during my tenure was established by my predecessor, the late Steve Speich. He devised its current appearance and implemented peer-reviewed articles.

Editing per se has been fascinating. I started from a grounding in basic journalism, but I’ve learned a vast amount about producing a professional-level journal. More experienced editors gave me valuable advice (but only when I asked), including Tony Gaston and David Duffy.

Besides editing the copy, I’ve learned desktop publishing—laying the whole thing out, page by page, in a dedicated layout program. That part may have been the most fun, since it’s partly art as well as computer manipulation.

(It’s also led to some frustrations, but that’s in the past now.)

The Editor has always been a member of the Executive Council, and I’ve learned a lot about running an organization like PSG. I’m especially indebted, for their experience and friendship, to long-time members such as Craig Harrison, Pat Baird, Mark Rauzon, and George Divoky. I’ve also enjoyed writing up “PSG News” and “Meeting News,” using the information I noted at EXCO meetings.

I am especially grateful to my editorial assistants over the years: Craig Harrison, Pat Baird, Jo Smith, Laura MacFarlane Tranquilla, Leslie Slater, Sarah Allen, and several Regional Representatives.

Times are changing. *Pacific Seabirds* now goes to about half the members via the website (the other half still prefer to receive a “hard copy” in the mail). The Communications Committee is considering more changes, starting with Volume 41 (2014). They plan to conduct a survey of PSG members later in the summer, to get your guidance on which features of *Pacific Seabirds* you’d like to retain, and which ones you hate or don’t care about.

Watch for an posting about the survey on PSG’s Listserv.

Volume 41 will be edited by Holly Freifeld, who has volunteered for one year, even though her career has headed away from seabirds for now. Thank you, Holly!

Anyone who would like to edit *Pacific Seabirds* in the future, or to assist in editing contributions to the journal, would be very welcome. Please contact Holly, or the Communications Coordinator, Hannah Nevins. I would be happy to supply suggestions—if asked!

Finally, two notes: I thank everyone who has read *Pacific Seabirds*, including people who sent me comments on the publication—both complimentary and corrective.

And maybe old editors refuse to give up. I will be issuing one more number, a Supplement to *Pacific Seabirds* 40(2), containing a peer-reviewed article and a report. This issue should appear in September 2014.

My best to everyone, and I hope to see you at the next Annual Meeting!

—Vivian Mendenhall

ARTICLE

HISTORICAL COLONY HARVESTING, AT-SEA HUNTING, AND LOCAL FISHING BYCATCH OF THE JAPANESE MURRELET AT BIROJIMA, MIYAZAKI-KEN, JAPAN

Kuniko Otsuki

Abstract: Information on colony harvesting, at-sea hunting, and local fishing bycatch of Japanese Murrelets (*Synthliboramphus wumizusume*) in the Birojima area, Miyazaki-ken, Japan, was obtained through interviews with 13 local residents of Kadogawa town. Egg harvesting occurred between 1912 (or possibly earlier) and 1992, but was heaviest in 1940 to 1959 during and after World War II at roughly 1,100–2,080 eggs per year. Between 1912 and 1992, about 47,740–111,880 eggs were harvested. Extensive adult harvesting (180–320 adults per year) occurred between 1944 and 1959, with much lower levels between 1960 and 1970 (16–30 adults per year). Between 1944 and 1970, about 3,056–5,450 adults were harvested. At-sea hunting of small numbers of murrelets (4–12 per year) occurred between 1951 and 1983, with lower numbers (5 per year) in 1940–1950. Between 1940 and 1983, about 187–451 murrelets were shot at sea. Local fishing bycatch of small numbers of murrelets (2–9 adults per year) since 1940 resulted in about 148–666 murrelets killed in fishing nets by 2013. Harvesting and hunting of Japanese Murrelets became illegal in 1918, but people did not follow these regulations until they were partly enforced after 1973. These activities finally stopped when seabird biologists were present on Birojima during the breeding season in 1993–1996 and the Kadogawa government began educating fishermen and the public in 1992. The population of Japanese Murrelets at Birojima likely declined between the 1940s and 1960s, due mainly to heavy adult and egg harvesting. Partial or complete recovery apparently had occurred by 1994, when 3,000 Japanese Murrelets (about 1,000–1,500 breeding pairs) were estimated and this colony was recognized as the largest in the world for this species.

Key Words: Birojima, egg, fishing bycatch, harvesting, hunting, Japanese Murrelet, *Synthliboramphus wumizusume*

Japanese abstract:

枇榔島のある宮崎県門川町(日本)において、地元住民 13 人からカンムリウミスズメの繁殖地における採集、洋上での狩猟、門川域内での混獲についての情報を得ることができた。卵の採集は、1912 年(これ以前の可能性あり)から 1992 年まで行われていたが、とりわけ第二次世界大戦前後の 1940 年から 1959 年にかけて、年間 1,100-2,080 卵程度の大規模な採集が行われていた。1912 年から 1992 年にかけて約 47,740-111,880 卵が採集されていたことになる。大規模な成鳥の採集が、1944 年から 1959 年にかけて行われ(年間 180-320 羽)、続く 1960 年から 1970 年にかけては低レベル(年間 16-30 羽)ながら採集が続いていた。1944 年から 1970 年にかけて、おおよそ 3,056-5,450 羽が採集されていたこととなる。1951 年から 1983 年にかけて、小規模ながら、洋上におけるカンムリウミスズメの狩猟が行われていた(年間 4-12 羽)。それ以前の 1940 年から 1950 年においても、カンムリウミスズメの狩猟はあったものの、捕獲の規模はさらに小規模なものと推定された(年間 5 羽)。1940 年から 1983 年にかけて、約 187-451 羽のカンムリウミスズメが洋上で撃たれていたことになる。門川地域内でのカンムリウミスズメの混獲の規模は小さく(年間 2-9 羽)、1940 年以来 2013 年までで約 148-666 羽が捕獲されたことになる。1918 年には、カンムリウミスズメを採集することも撃つことも違法ではあったものの、1973 年に法規制が一部厳しくなるまで、人々は法律のことは特に気にかけていた様子はない。これらの行動(成鳥や卵の採集、狩猟)は、1993 年-1996 年のカンムリウミスズメの繁殖期に生物学者が枇榔島に存在したこと、および 1992 年開始された門川町の釣り人と一般に対する啓発活動により、ようやく終息を迎えることになった。カンムリウミスズメの個体数は、1940 年から 1960 年代に、おもに、成鳥と卵の大規模な採集により、減少したものと考えられる。1994 年にカンムリウミスズメの個体数が 3,000 羽(約 1,000-1,500 ペア)と推定され、このコロニーが本種にける世界最大のものとして認識された時には、ある程度のもしくは大きな規模での個体数の回復がみられたのは明らかである。

INTRODUCTION

Birojima ($32^{\circ} 28' \text{ N}$, $131^{\circ} 44' \text{ E}$), also known as Biro Island, is a group of small islands (including the main island, Tatebae Rock, and Ko-Biro Rock) located off the coast of Miyazaki-ken, Japan, about 7 km east of the main town area of Kadogawa and 2.1 km off east of Makiyama district of Kadogawa (Figures 1 and 2). Birojima hosts the largest known breeding colony of the Japanese Murrelet (*Synthliboramphus wumizusume*) in the world (Ono 1995, Gaston and Jones 1998, Birdlife International 2001) and these islands and their surrounding waters have been designated as a wildlife protection area. At Birojima, the Japanese Murrelet nests mainly in rock crevices, and clutches of 2 eggs are laid between mid February and mid April (Whitworth et al. 2014).

In 2011–2013, the Japanese Murrelet Population Survey Team (working through the Japan Seabird Group) conducted spotlight surveys and nest monitoring to gather standardized baseline data for long-term monitoring of changes in population size and reproductive success (Whitworth et al. 2012, 2014; Carter et al. 2013). In addition, information on education, protection, and conservation issues has been assembled (Otsuki and Kubota 2012). Harvesting murrelet eggs for human

food occurred in the early to mid-20th century at certain Japanese Murrelet colonies in Japan, but such activities were poorly documented (Kuroki 1963, Kuroki et al. 1966, Carter et al. 2002). Because domestic chickens and eggs were very expensive and hard to get after World War II, some local residents harvested Japanese Murrelet eggs and adults from Birojima. This probably occurred until the 1960s, but the exact timing and extent of such harvesting has not been described (Otsuki and Kubota 2012). Low levels of fishing bycatch of murrelets also were known near Birojima but were not well described (Otsuki and Kubota 2012). Higher bycatch mortality in high-seas drift nets had been measured in the non-breeding season in offshore waters northeast of Honshu (mainly between 38° and 44° N , and between 142°

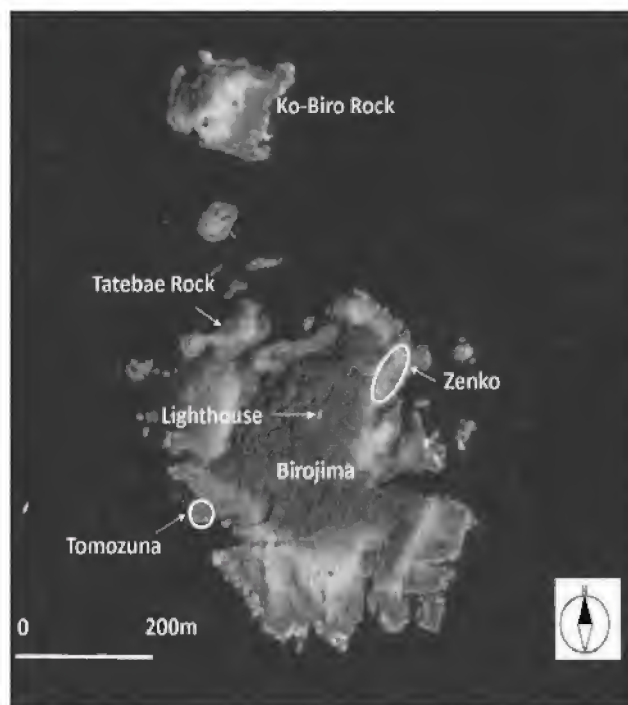
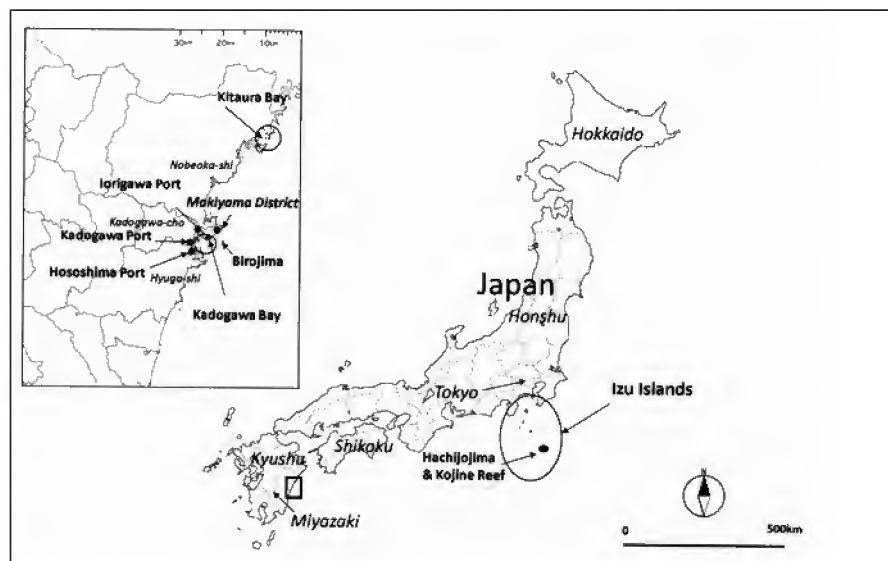


FIGURE 2. Aerial view of the main island of Birojima (with Zenko and Tomozuna areas indicated), Tatebae Rock, and Ko-Biro Rock.

FIGURE 1. Location of Birojima near Kadogawa, Miyazaki-ken, Japan.



and 157° E ; Piatt and Gould 1994).

In this paper, I summarize additional information obtained through interviews with local Kadogawa residents in 2013–2014 about the timing, methods, and degree of impacts from extensive egg harvesting and low levels of local fishing bycatch. In addition, I document extensive adult harvesting at Birojima and moderate levels of at-sea hunting near Birojima for the first time. With this more detailed information, I assess historical impacts to this colony from most human sources.

METHODS

In 2013, I heard from a shop owner in Nobeoka about M. Kuroki of Kadogawa, who had hunted Japanese Murrelets at sea around Birojima in the past. I contacted M. Kuroki and met with him for an interview to obtain more details. This interview encouraged me to attempt to gather more information about egg and adult harvesting and fishing bycatch by Kadogawa residents. Each person interviewed told me about other people to interview. In each interview, I asked the person's name, birth

year, what form of harvesting, hunting or bycatch of murrelets they had conducted, duration and frequency of this activity, and any other details of these activities that they could recall. In Japan, the use of information provided by individuals is not illegal for academic use.

RESULTS

I obtained historical information about murrelet harvesting, hunting and bycatch in the Birojima area from 13 Kadogawa residents. Information from 9 people about egg and adult harvesting at Birojima is summarized in Tables 1 and 2. Information from 1 person about at-sea hunting and from 6 people about local fishing bycatch is summarized in Table 3. Below, important details of interviews are restated to support and clarify information in the tables. Interview information is presented in alphabetical order by last name of the person interviewed within each category.

TABLE 1. Kadogawa residents interviewed about colony harvesting, at-sea hunting and local fishing bycatch of Japanese Murrelets in the Birojima area.

Resident interviewed	Original source	Original source birth year	Information type ¹	Interview methods ²
Ikeda, H.	Todaka, M.	1954-1955 (est.)	Eha	M, T
Iwakiri, H.	Self	1965	BC	T
Iwata, K.	Self	1944	EAHa	M, T
Kawano, F.	Self	1932	EHa	T
Kuroda, T.	Self	1945 (est.)	BC	M, T
Kuroki, A.	Self	1965	BC	M, T
Kuroki, M.	Self	1938	EAHa, AHu	M, T, E
Matsuda, I.	Self	1931	EAHa, BC	T
Nagato, K.	Kuroki, K.	1946-1948 (est.)	EHa	M, T
Nagato, M.	Self	1972	LF	M, T, E
Ogawa, T.	Self	1937	EHa, BC	T
Takatsuki, H.	Self	1924	Eha, EAHa	T
Yonezawa, G.	Self	1948	EHa	M, T
	Takatsuki, M.	1919 (est.)	EHa	

¹ EAHa, egg and adult harvesting; EHa, egg harvesting; AHu, adult hunting; BC, bycatch; LF local fishing. ² M; meeting; T, telephone; E, email.

TABLE 2. Numbers of eggs and adults harvested at Birojima (including Tatebae Rock) in 1932-1992, as reported by Kadogawa residents.

Period	Harvesting trips / year	Eggs		Adults		Original source
		Per trip	Estimated total / year	Per trip	Estimated total / year	
1932-1954	Many	Many	Many	Unknown	Unknown	Takatsuki, M.
1937-1954	Some	200	400	0	0	Matsuda, I.
1944-1954	2-3	60-120	120-480	Some	Unknown	Takatsuki, H.
1945-1955	2	60-120	120-240	10	20	Matsuda, I.
1952-1953	Some	<10	Unknown	0	0	Ogawa, T.
1955-1959	Several	Some	Unknown	0	0	Kuroki, K.
1957-1959	2-3	200-300	400-900	40-50	80-150	Iwata, K.
1961-1963	3	10	30	0	0	Yonezawa, G.
~1940s-1970	Some	Some	Unknown	Some	Unknown	Kuroki, M.
1971-1973	2-3	40-60	80-180	0	0	Iwata, K.
~1970s-1992	Some	100-200	Unknown	0	0	Todaka, M.

TABLE 3. Numbers of Japanese Murrelets killed by hunting, fishing bycatch or surf fishing around Birojima in 1945-2013, as reported by Kadogawa residents.

Mortality source	Time period	Numbers of murrelets	Hunting or fishing method ¹	Notes	Original source
At-sea Hunting	1951–1968	1–2/year	Double-barreled shotgun	Maximum 5–6/trip on one trip	Kuroki, M.
Fishing Bycatch	1945–1955	0	SN (Oshiki)		Matsuda, I.
	1952–1953	0	SN (Oshiki)		Ogawa, T.
	2009 or 2010	1	T		Kuroda, T.
	2012–2013	0	—	Historical bycatch reported but no details available	Iwakiri, E.
	2012–2013	2–3	SN		Kuroki, A.
	2013	0	T		Kuroda, T.
	—	1–2 netted and released	T		Matsuda, I.
Surf Fishing	2011	1	SF		Nagato, M.

¹ SN, set net; T, trawl; SF, surf fishing.

Egg and adult harvesting

Ikeda, H.: In 1993, M. Todaka of Makiyama told Ikeda about egg harvesting activities at Birojima (Table 1). Ikeda has operated a charter boat service for fishermen that surf fish from shore at Birojima or other nearby islands. Todaka was one of his clients. Between 1912 and 1960s (during the Taisho and early Showa eras) and probably earlier than 1912, people from Makiyama area would visit Birojima to collect large numbers of murrelet eggs (about 100–200 eggs per trip; several trips per year)

(Table 2), with most harvesting occurring at Tatebae Rock. They reached the island by rowing (or in more recent times using small outboard engines). In 1993, Todaka told Ikeda that he could no longer harvest murrelet eggs from Birojima because some scientists were living on the island for about two months, during the murrelet breeding season.

Iwata, K.: In 1957–1959, Iwata's father took him and his older brothers (3–4 people per trip) in a small wooden boat (without an outboard engine) to Birojima (main island) to collect murrelet

eggs (Table 1). They left the mainland from a little bay called “Funakakushi” (or “place to hide boats”) (Figures 1 and 3) in the Makiyama district of Kadogawa. Only four boats used this little bay. The boat was anchored by Birojima at Tomozuna, near the current landing site. Iwata's family searched for eggs all over the island, including the top of the island where many nests occurred in 2011–2013 (Whitworth et al. 2012, 2014; Carter et al. 2013). This group usually harvested 200–300 eggs per trip (Table 2), although Iwata himself (the youngest team member) only took 30–40 eggs per trip. They usually went to the island 2 or 3 times during the harvesting season between 21 March and mid-April. At this time in Makiyama, 6–7 people visited Birojima for murrelet egg harvesting, usually 2–4 people in a group.

While egg harvesting, the Iwatas also captured and killed adult murrelets in their nest sites. Usually, about 40–50 birds were taken per trip, totaling about 80–150 birds per year (Table 2). Other people from Makiyama also harvested adults from nest sites but numbers are not known.

After 1959, the Iwata family moved away from Kadogawa, but returned in 1971. He resumed murrelet egg harvesting at Birojima with his friend in 1971–1973. They took a small boat powered by an outboard engine from Iorigawa port to Birojima. About 40–60 eggs were harvested per trip and they made 2–3 trips during harvesting



FIGURE 3. K. Iwata pointing at “Funakakushi” in the Makiyama district of Kadogawa.

TABLE 4. Changes in the hunting period between 1919 and 2014 (WCMSG 2001). The periods applied to all of Japan except Hokkaido.

Year	Hunting Period
1919–1947	15 October–15 April
1948–1954	1 November–last day of February
1955–1962	1 November–15 March
1963–1977	1 November–15 February
1978–2014	15 November–15 February

season (Table 2). The number of eggs in a nest site was usually 2 but ranged between 1 and 3. Iwata often went back to the same nest sites to find eggs on each trip. He sometimes found eggs in the same nest site where he took eggs on a previous trip. For example, he might take the single egg on his first trip but find 2 eggs in the same nest site on a later trip. Some murrelets appeared to replace lost eggs. Some eggs had large embryos inside; these were not eaten.

In 1974, the area was designated as Nippo Kaigan Quasi-National Park (Natural Parks Foundation 2014), so they stopped egg harvesting although some other people continued harvesting eggs (Table 2). In 1975, the Japanese Murrelet became a National Monument (Hasegawa 1995), and more people quit harvesting eggs (Table 2).

Kuroki, M.: Neighbor fishermen brought murrelet eggs and adults from Birojima to the Kuroki family in Kadogawa and told Kuroki about their harvesting activities (Table 1). When fishermen had time in spring, they harvested eggs and adults. After World War II, the price of one chicken egg was about 10 yen, and the daily wage was about 250 yen. To get 10 chicken eggs, people had to work for 2 days (for 16 hours). Egg harvesting occurred mainly at Tatebae Rock, the arched rock on the west side of the main island of Birojima (Figures 2 and 4). Unfortunately, the rock is not easy to climb and at least two people died while harvesting eggs. Egg and adult harvesting continued until about 1970 (Table 2).

Nagato, K.: K. Kuroki of Makiyama told Nagato about egg harvesting at Birojima (Table 1). Kuroki's father was a fisherman. In the 1960s, when her father was not fishing during spring school break (i.e., end of March to early April), he invited 3–4 children (ages 9–15)

to come to Birojima to collect eggs. They took a small boat with an outboard engine for the short ride (10–15 minutes) from Makiyama to Birojima. Several trips per year occurred because: (1) they did not stay overnight on the island; (2) eggs were in high demand due to the shortage of chicken eggs; and (3) refrigerators were not available to preserve eggs on the mainland. They went to the main island (i.e., not Tatebae Rock) because it was easier climbing for children and eggs were relatively easy to find. Murrelet eggs were considered a special snack food that people looked forward to eating each spring.

People from around Kadogawa port did not go to Birojima for egg harvesting because it was too far by boat.

Ogawa, T. and Matsuda, I.: Ogawa and Matsuda (Table 1) were fishermen that often set nets about 200 m off northeast Birojima. Matsuda was the

leader of the fishing program between 1945 and 1955 and Ogawa joined in 1952–1953. This program had 30–40 people in about 5 boats, and they sometimes had to anchor their vessels off Birojima during rough sea conditions. They did not harvest eggs and adults heavily, but they loved to eat murrelet eggs and adults because they only brought white rice for lunch. Eggs and adults were harvested after 21 March. On average, about 2 harvesting trips occurred per year in 11 years from 1945 to 1955. Each person would collect 2–3 eggs per trip, resulting in 60–120 eggs per trip and 120–240 eggs per year (Table 2). On one occasion, Ogawa remembered finding about 10 eggs in one area and took them all, but he could not recall egg numbers taken by all people. Total egg numbers harvested in 1945–1955 could be higher than estimated. They harvested about 10 birds per trip, or about 20 birds per year (Table 2).

They mainly harvested eggs in the forest on the top of the island where the lighthouse was later built in 1976 (Figure 2). Eggs were found in crevices covered with grasses. They reached into crevices at the time of the breeding season when adults were incubating 2 eggs. Matsuda did not notice any decline of the murrelet population in 1945–1955 but he later noticed some decline by about 1984, when he finished set netting at 53 years old.



FIGURE 4. Tatebae Rock, off the northwest shore of the main island of Birojima, April 2011. Photo by D. Whitworth.

Matsuda reported at least 4 murrelet egg sellers (about 30-year-old men) in the Makiyama district, due to the lack of chicken eggs after World War II. Two of them would go together to Tatebae Rocks and Zenko (Figure 2) and usually would collect more than 200 eggs in one trip. At least 400 eggs per year were collected (Table 2). Eggs were often found in the same nest sites where a seller took eggs on a previous trip. The price of one murrelet egg probably was about 1–2 yen. Matsuda did not know when murrelet egg selling had first started but he recalled first meeting sellers in 1937 or 1938 (when Matsuda was 6 or 7 years old) and last remembered them in 1953 or 1954.

Takatsuki, H.: In 1944–1954, Takatsuki went to Birojima with 2–3 neighbors by small wooden boat (without an outboard engine) and harvested murrelet eggs (Tables 1 and 2). They usually went to the island 2 or 3 times during the harvesting season and usually harvested 60–120 eggs per trip, totaling about 120–360 eggs per year. At this time in Makiyama, 7–8 people visited Birojima for murrelet egg harvesting. On average, each person went to the island 7 times and each person harvested 30–40 eggs per trip or 1,470–2,240 eggs per year. Some adult murrelets also were harvested but Takatsuki could not provide any details.

Yonezawa, G.: In 1961–1963, Yonezawa was taken by the father of his friend T. Yasuda to Birojima for surf fishing. Each trip usually involved 5–6 people in a small boat with an outboard engine. They left home at 03:00 h (Japanese Standard Time) and fished with bamboo fishing rods until dawn. After dawn, Yonezawa and Yasuda harvested murrelet eggs, usually about 10 eggs per trip (Table 2). They usually went to the island 3 times during the murrelet breeding season. M. Takatsuki also told Yonezawa about egg harvesting at Birojima (Tables 1 and 2). Takatsuki was a fisherman in the past. Yonezawa assumed that Takatsuki became a fisherman in 1932 when he finished elementary school. If weather and

sea conditions were suitable, he went to the island to collect eggs almost every sunny day. He harvested large numbers of murrelet eggs on each trip (Table 2).

At-Sea Hunting

Kuroki, M.: Often with his father, Kuroki hunted seabirds on the ocean beginning in 1951, using a double-barreled shotgun from a small wooden boat (about 7 m long) (Table 3). In 1961 or 1962, he obtained a hunting license. Their main target species was the Great Cormorant (*Phalacrocorax carbo*). These cormorants breed on Ko-Biro Rock, the largest rock north of the main island of Birojima (Ono 1995; Figure 2). The legal hunting period occurred between October and March but changed periodically (Table 4). Hunting occurred mainly near Birojima between about 10:00 and 15:00 h. A hunting party would consist of about five people. When no cormorants were obtained, they would shoot a few Japanese Murrelets if possible (although it was not on the 1918 game bird list) to bring some birds home for food from the hunting trip. Usually, only 1–2 birds were shot during the hunting period. In one unusual year, the hunting group shot about 5–6 birds. Other hunting groups also shot cormorants in this same area but Kuroki did not know if they shot any Japanese Murrelets.

Around 1983, Kuroki's hunting group moved their hunting area to near Kitaura, about 26 km north of Birojima (Figure 1). The Japan Coast Guard had become very strict about hunting near Birojima at this time. Birojima is within Nippo Kaigan Quasi-National Park and hunting of cormorants was illegal in the park after it was established in 1974. Hunting continued near Kitaura until around 1989.

Local Fishing Bycatch

Three types of fishing activity were mentioned in interviews. Set nets and trawls are used in commercial nearshore fisheries. A set net (bottom-set net, *teichi-ami*) is a series of nets anchored to the sea bottom that directs fish into a

bag or trap; fish are harvested by pulling the net into a boat. Small trawls are also used to harvest fish, prawns, and other species. Surf fishing is a sport, in which the fisher stands on shore and uses a rod to cast lure and hook into the waves.

Iwakiri, E.: No murrelets were caught by the Iorigawa fishery cooperative in 2012–2013, but bycatch was reported in the past (exact years unknown).

Kuroda, T.: Kuroda belongs to the Kadogawa fishery cooperative. He caught no murrelets in his set nets. He caught one murrelet in his trawl net when pulling it up at night in about 2010 (Table 3). Unfortunately, this bird died by the next morning.

Kuroki, A.: Kuroki belongs to the Kadogawa fishery cooperative. He usually caught about 2–3 murrelets per year in 70 m x 3 m nylon fishing nets (mesh size: 10 cm x 10 cm) set on the bottom in shallow waters (7–8 m deep) (Table 3). However, none were caught in 2012–2013.

Nagato, M.: Murrelets are only rarely caught on surf-fishing hooks. Her friend caught one murrelet on his hook while surf fishing at Hososhima port, Hyuga-shi (Figure 1) in spring 2011 (Table 3) (not in 2009, as reported by Otsuki and Kubota [2012]).

Ogawa, T., Matsuda, I. and Takatsuki, H.: These retired fishermen fished near Birojima in the past but did not catch any murrelets in their set nets. A few murrelets (1–2 birds per year) have been attracted to bright lights when fishermen pull up nets and they have been caught in nets but are rescued and released (Table 3).

DISCUSSION

Wildlife laws that protect Japanese Murrelets from harvesting and hunting at Birojima evolved slowly in the 20th century. Four main protections have occurred for Japanese Murrelets in the Birojima region that gradually helped end these activities (Figure 5): (1) in 1918, the Game Law made it illegal to harvest murrelets (eggs and adults) or hunt murrelets; (2) in 1974, Nippo Kaigan Quasi-National Park

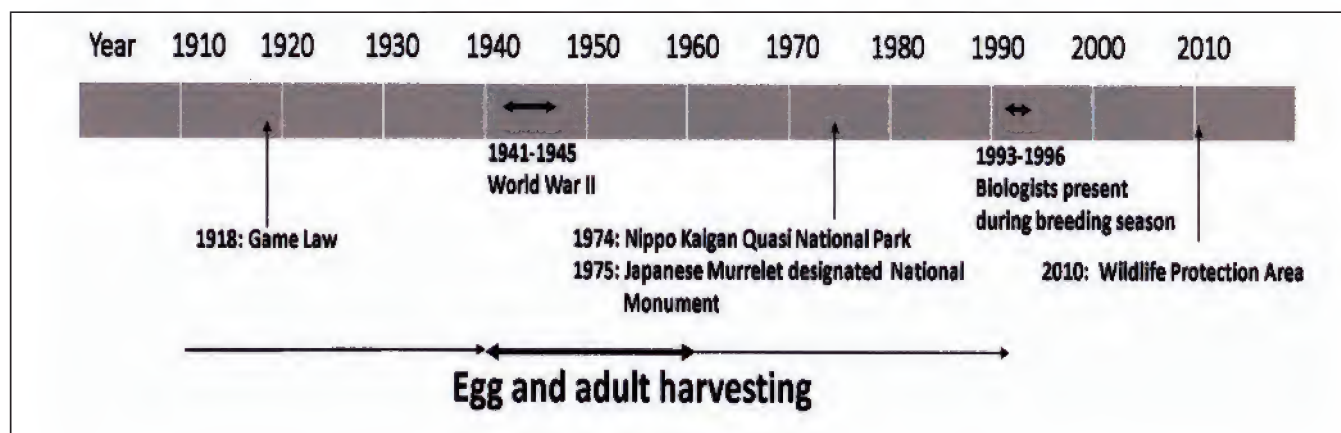


FIGURE 5. Hunting regulations and protection of the Japanese Murrelet and Birojima in relation to colony harvesting in 1910-1992 (Hasegawa 1995; WCMMSG 2013; Ministry of the Environment 2014; Natural Parks Foundation 2014). The thick line refers to heavy harvesting and the thin line to less heavy harvesting.

was designated, including Birojima and surrounding waters; (3) in 1975, the Japanese Murrelet was designated as a national monument; and (4) in 2010, Birojima and surrounding waters were designated as a Wildlife Protection Area (Ministry of the Environment 2014). From 1918 to 1983-1993, some people ignored these laws and designations either because: (1) they did not know about the laws; (2) people continued egg harvesting activities because of traditions that had developed before 1918; (3) people relied to a greater extent on egg and adult harvesting and possibly hunting during and after World War II, when fresh eggs and meat were difficult to obtain; or (4) little or no enforcement and few patrols were conducted by the Japan Coast Guard. At times, police officers were with hunters when illegal hunting occurred, but officers did not enforce the laws; and marine patrols were ineffective until the early 1980s (M. Kuroki and H. Ikeda, pers. comm.). Below, I summarize information obtained from interviews about egg and adult harvesting, at-sea hunting and local fishing bycatch.

Egg harvesting

Egg harvesting at Birojima likely occurred through most of the 20th century until about 1993, but heavy harvesting occurred in 1940-1960s, during and after World War II (Table 5). Us-

ing available information, a conservative estimate of the annual egg harvest during the 1940s to 1960s was about 1,100-2,080 eggs per year. To obtain this estimate, I first assumed that 6-8 Makiyama residents formed 3 main groups (I. Iwata and H. Takatsuki, pers. comm.). Second, I summed the estimated egg harvest for the 3 groups (Table 2). Third, I added 400 eggs collected by egg sellers. Finally, I added about 60 eggs to account for additional harvesting by Takatsuki. This estimate was similar to H. Takatsuki's rough estimate of 1,470-2,240 eggs per year (see above).

While this estimate is rough and may be low, I think it is unlikely that more than 2,500-3,000 eggs were harvested in any year because: (1) population size in 1993-1994 and 2011-2012 only ranged from about 1,000 to 1,800 pairs (Ono et al. 1994, Nakamura and Ono 1997; Carter et al. 2013); and (2) some murrelets must have been able to reproduce successfully for the colony to sustain such heavy egg harvesting (especially when combined

with adult harvesting in the late 1950s to late 1960s—see below); although many eggs likely were replaced by murrelets after harvesting (as suspected by egg harvesters—see above). Ono (1993) also noted the possibility of replacement of lost eggs by Japanese Murrelets at Kojine Reef off Hachijojima in the Izu Islands in 1992 (Ono 1993; Figure 1). Replacement eggs have been documented with marked birds in the closely-related Scripps's Murrelet (*S. scrippsi*) in southern California, USA, which is at a similar latitude as Birojima (33.5° N; Murray et al. 1983); however, replacement eggs have not been documented in Ancient Murrelets (*S. antiquus*) at higher latitudes (52-54° N) in British Columbia, Canada (Gaston 1992).

I suspect that egg harvesting in the 1910s (and likely earlier) to 1930s was lower than in the 1940s to 1960s,

TABLE 5. Estimated numbers of Japanese Murrelet eggs harvested at Birojima (including Tatebae Rock) in 1912-1992. See text for methods of estimation.

Period	Years	Estimated eggs harvested per year	Estimated total eggs harvested
1912-1939	28	550-2,080	15,400-58,800
1940-1959	20	1,100-2,080	22,000-41,600
1960-1975	16	540	8,640
1976-1992	17	100-200	1,700-3,400
Total	81	—	47,740-111,880

because chicken eggs were available and outboard engines were less available. By the mid 1970s, many people stopped harvesting eggs because it was clear that egg harvesting was illegal when Nippo Kaigan Quasi-National Park was established in 1974 and the Japanese Murrelet became a National Monument in 1975. Eggs also may have become more difficult to find and harvest at this time if population decline had occurred. By 1993–1996, egg harvesting stopped completely at Birojima, after four years of island occupation by biologists K. Ono and J. Fries, during spring when eggs were available. Overall, I estimate that 47,740–111,880 eggs were harvested over 81 years between 1912 and 1992 (Table 5).

Adult harvesting

Adult harvesting at Birojima likely occurred in the 1940s to 1960s (Table 6) during and after World War II. Heavy harvesting was recorded in 1957–1959 when 80–150 adults were killed per year by one group, totaling about 240–450 adults in these three years alone. In the late 1950s, similar harvesting of adults by other groups from Makiyama also occurred (K. Iwata and H. Takatsuki, pers. comm.). I suspect strongly that Iwata's father harvested adults from about 1944 to 1959. At least two groups plus Matsuda's set-netting group harvested large numbers of murrelets. All three of these groups could have harvested similar numbers of adults, because adult murrelets were relatively abundant during harvesting in 1945–1955 (I. Matsuda, pers. comm.) and this situation might have continued until 1959 (K. Iwata, pers. comm.). After 1959, at least one group harvested adults until 1970, although population size appeared to have declined during this period (I. Matsuda, pers. comm.).

A rough conservative estimate of the number of adults harvested in 1944–1959 is 180–320 adults per year (Table 6), assuming that two groups each harvested 80–150 birds per year plus Matsuda's group harvested 20 per year (Table 2). For 1960–1970,

I roughly estimated 20% of the annual level in 1944–1959 (i.e., 16–30 adults per year) by one group (Table 6), based on 80% lower egg harvesting by Iwata's group in 1957–1959 versus 1971–1973, and assuming this group's harvest level in 1971–1973 was not affected greatly by the lower number of people harvesting (K. Iwata, pers. comm.; Table 2). By about 1970, harvesting of adults appeared to stop for four possible reasons: (1) it may have been better understood that killing adults was illegal; (2) population decline had occurred and eggs and adults were becoming more difficult to harvest; (3) chicken eggs and meat were easily available; or (4) old traditions of egg and adult harvesting were reduced or discontinued, possibly because many individuals that had harvested heavily since World War II were too old to continue harvesting. I estimate that 3,056–5,450 adults were killed over 27 years in 1944–1970 (Table 6).

At-sea hunting

By 1983, hunting stopped near Birojima when the Japan Coast Guard began to enforce protection of birds in Nippo Kaigan Quasi-National Park. While small numbers of adults were reported shot by Kuroki each year in 1951–1983 (Table 6), other hunters also likely killed small numbers of murrelets that were not reported. Kuroki's father and other hunters also shot seabirds (including a few murrelets) before 1951, but shooting murrelets likely did not occur before 1940 because outboard engines were more difficult to obtain before and during World War II. I conservatively estimate that about 4–12 murrelets per year likely were shot from 1940–1983, assuming a minimum of two hunting groups each shooting between 2 and 6 murrelets per year; this resulted in an estimate of 187–451 murrelets shot over 44 years from 1940–1983 (Table 6).

Hunting stopped in 1989 for several reasons, including: (1) the Kitaura area also is within Nippo Kaigan Quasi-National Park (i.e., hunting of cormorants also was illegal at Kitaura); (2) most hunting was for sport at this time,

and shotgun shells were very expensive—they often used more than 100 shells, which cost more than 7,200 yen (i.e., over US \$100 at this time); (3) some hunters preferred to hunt wild boar (*Sus scrofa*), which was in high demand; and (4) cormorants (the principal goal of hunters) were not very tasty.

Local fishing bycatch

Local fishing bycatch of murrelets or any seabirds has been very poorly documented in the Birojima and Kadogawa area. I could not obtain any specific details about historical bycatch prior to 2012 (except that it had occurred in the past); I wondered if fishermen were simply unwilling to tell me about it. Fishermen were willing to tell me that small numbers of murrelets had been killed in nets in 2012–2013 and one murrelet was caught on a surf-fishing hook in 2011.

Small numbers of murrelets (about 2–9 per year) also appeared to be killed each year in fishing nets between at least about 1940 and 2013, assuming that 2–3 fishermen caught about 1–3 murrelets per year each; this resulted in an estimate of 148–666 murrelets killed over 74 years (Table 6). Murrelets killed near Birojima likely belong to the local Birojima population, because many murrelets are present in nocturnal at-sea congregations in waters within a few kilometers of the breeding colony from about December to May, with only a few in June (Nakamura and Kojima 2010). In contrast, relatively high bycatch mortality of Japanese Murrelets was documented in offshore areas off northeastern Honshu (mainly a Korean squid fishery) in the non-breeding season, in 1990 (98–417 birds) and 1991 (40–160 birds) (Piatt and Gould 1994). Japanese Murrelets breeding on Birojima have been thought to move toward the east or northeast after breeding (Nakamura et al. 2010), but it is not clear if any murrelets from Birojima disperse far to the northeast and offshore in the non-breeding season. All birds killed off northeastern Honshu may have been from colonies

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TABLE 6. Estimated numbers of Japanese Murrelets killed by colony harvesting, at-sea hunting, and fishing bycatch around Birojima in 1940–2013. See text for methods of estimation.

Mortality Source	Period	Years	Estimated murrelets killed per year	Estimated total murrelets killed
Colony harvesting	1944–1959	16	180–320	2,880–5,120
	1960–1970	11	16–30	176–330
	Subtotal	27	—	3,056–5,450
At-sea hunting	1940–1950	11	5	55
	1951–1983	33	4–12	132–396
	Subtotal	44	—	187–451
Fishing bycatch	1940–2013	74	2–9	148–666
Total	—	—	—	3,397–6,561

in the Izu Islands (Carter et al. 2002). It is also not clear when this higher mortality developed off northeastern Honshu, but probably after the 1960s.

Impact to the Birojima murrelet population

The exact degree of impact on the Birojima murrelet population from colony harvesting, at-sea hunting, and local fishing bycatch is difficult to assess with available information. Killing breeding adult murrelets can have a large impact on the population, due to high juvenile mortality and delayed breeding. Given that murrelets may live to be over 10 years old (assuming similar demography to Ancient Murrelets; Gaston and Jones 1998), many years of reproduction by each individual are lost to the population when one adult is killed. Murrelets killed at sea may have been adults or subadults. Killing subadults can have less impact on the population, since some may not survive to become breeding adults. Relatively high egg harvesting also can have less impact than adult mortality, because many eggs do not contribute to birds that survive to breeding age; also, many harvested eggs can probably be replaced by the nesting pair (see above). However, sufficient eggs must hatch over time to replace adults that die, in order to maintain population size.

With much adult mortality and heavy egg harvesting between the 1940s and 1960s, the population of Japanese Murrelets at Birojima probably declined. However, long-term monitoring data are not available to demonstrate how much of a decline may have occurred. Two potential pieces of evidence of decline were: (1) reduced egg harvesting (40–60 per year) in 1971–1973 by Iwata, compared to 200–300 per year in 1957–1959; and (2) the stopping of adult harvesting in about 1970. Egg and adult harvesting may have gradually declined during the 1960s and early 1970s because eggs and adults were harder to find as the population declined.

However, chicken eggs also became more affordable and available in the 1960s. In the late 1940s, a chicken egg cost about 10 yen, and the daily wage was about 250 yen (M. Kuroki, pers. comm.). Surprisingly, the cost of one chicken egg is still about the same today, but the daily wage for part-time workers is now between 5,600 and 7,200 yen. To get 10 chicken eggs, people now work for only 30 minutes. Fewer people thus had sufficient reasons to harvest murrelet eggs from the dangerous slopes of Birojima after 1970, although small numbers of people carried on this tradition. I suspect that between 100 and 200 eggs were harvested per year between 1976 and 1992. With

stoppage of adult harvesting and reduced egg harvesting in the 1970s, population size likely began to recover. With reduced hunting in the early 1980s, further recovery of the population size likely occurred, even with continuing relatively low local fishing bycatch.

From the 1910s to the 1940s, low to moderate harvesting of eggs appeared to be the main conservation problem facing the Birojima murrelet population, but it was not clear whether the colony declined during this period. In the 1940s to 1970s, heavy harvesting of eggs and adult murrelets was a significant conservation problem, and the colony likely was smaller than in the 1994–2012. A relatively large murrelet colony at Birojima murrelet population (i.e., 3,000 birds or roughly 1,000–1,500 breeding pairs) was first measured in 1994, and the importance of this colony to the species was recognized at this time (Nakamura 1994, Ono et al. 1994, Ono 1995, Nakamura and Ono 1997, Gaston and Jones 1998, Otsuki and Kubota 2012, Carter et al. 2013). However, for this relatively large Birojima colony to exist in 1994, much recovery of the population size seems likely to have occurred since the 1960s, as a result of the stoppage of adult and egg harvesting. This apparent recovery in the 1970s to early 1990s, and the relatively high population size in 1994 and 2012, possibly suggests that mortality of birds from Birojima in offshore driftnets off northeast Honshu was not high (or may not have occurred) between the 1960s and 2012.

Crow predation was found to be a new and significant problem for Japanese Murrelets at Birojima in 1993–1995. This apparently was related to enhanced crow populations from eating bait and garbage left behind by surf fishermen (Ono et al. 1995, Otsuki and Kubota 2012). However, evidence of relatively high crow predation at this time was documented for the first time by careful biological studies, and also may have been related to a larger murrelet population than in the past. The Kadogawa government has addressed the crow problem

through education of fishermen and the public (Otsuki and Kubota 2012).

Long-term monitoring has not been conducted to determine if the population has increased or decreased since the early 1990s, when education efforts began (Otsuki and Kubota 2012). However, surveys in 2012 indicated that population size was about 1,200–1,800 breeding pairs, roughly the same as estimated in 1994 (Carter et al. 2013), suggesting no major changes in population size since 1993–1994. With the new baseline data in 2011–2013 (Whitworth et al. 2012, 2014; Carter et al. 2013), changes in murrelet population size and reproductive success can be measured in the future.

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TRANSLATIONS

Following are three translations of articles on murrelets that have not been available to many readers. The first was published in Japanese 80 years ago; the other two are recent research that originally appeared in Russian.

LIFE HISTORY OF *Synthliboramphus antiquus*

T. Ishizawa

Originally published in *Plants and Animals*, Tokyo 1: 279-280, 1933.

Translated from Japanese by Charles A. Pell.

Editor's note: The PSG Japanese Seabird Conservation Committee asked Charles A. Pell to translate this article into English to make it more widely available. The article provides the first information about the breeding biology of the Ancient Murrelet in South Korea at Chilbal-do Island. Some aspects of the species' biology were first reported in this paper, although some work also had been published previously for Alaska (Bendire 1895, Heath 1915, Willet 1915).

The reader should be aware that some aspects of biology reported herein have been interpreted differently since then, based on subsequent data (e.g. Sealy 1976, Gaston 1992, Gaston and Jones 1998, Gaston and Shoji 2010, Sealy et al. 2013). Recent studies of Ancient Murrelets also have been conducted at Chilbal-do Island and Gugul-do Island in South Korea (e.g., Park et al. 2012). —**Harry Carter**

Translator's note: The author refers to the “Kurile Islands” (Japanese spelling), and to North and South Korea together, as part of Japan. Japan controlled these areas when this paper was published in 1933. However, the “Kuril Islands” (Russian spelling) are now part of Russia, and the two Koreas are independent countries, although certain islands are still disputed. Other notes by the translator are in brackets in the text. —**Charles A. Pell**

This translation is followed by the original text in Japanese.

Ancient Murrelets [*Synthliboramphus antiquus*] are distributed at sea in Kamchatka and its offshore Commander Islands, in the Aleutian Chain, and in Japan from the Kurile Islands to Korea and Taiwan. Their breeding range is limited to the north Pacific regions cited above, and occurs in Japan in the Kuriles and small islands such as Nishijima [Seo-do in Korean, near Chodo Island, Cahngyon, on the east coast of North Korea], Sobajima [location unknown], and Shichihatsuto [Chilbal-do in Korean, used hereafter in this translation] that lie off the southwest coast of the Korean Peninsula (off South Korea at 34° 47' 16" N, 125° 47' 17" E). Except for these areas, Ancient Murrelets appear only during the nonbreeding season in the other areas [of Japan].

The Ancient Murrelet is a seabird, and its body weight ranges between 187 and 225 g. Body colors are dark gray back with white breast and belly. Wing

length is 131 mm, the short tail is 37 mm, and bill length is 13 mm. Smaller than a dove, at first glance the bird gives the impression of a sparrow, hence the acquisition of the Japanese name *umisuzume*, meaning sea sparrow.

This article contains new information sent to me by Mr. Hideo Hashimoto, based on his enthusiastically gathered observations that responded to my earlier request while he was stationed on Chilbal-do. His several transmissions cover a wide range of interests that contribute to our knowledge of Ancient Murrelet life history.

Chilbal-do is a small island entirely composed of rock, with a lighthouse located in a flat area at the top of the island. Several members of a humble lighthouse keeper's family lead a meager life in that remote place. The entire island is covered by a luxuriant growth of a less than one-meter tall sedge called *higesuge* [Oahu sedge, *Carex oahuensis*

boottiana], while other vegetation is confined to just a few small shrubs.

In late February, Ancient Murrelets form large flocks [i.e., at-sea congregations that form beside breeding islands in the late afternoon and at night], and converge to come ashore on this lonely isolated island for the purpose of breeding, to the delight of island residents.

During that time flocks appear every evening, softly calling, “Tsu, tsu, tsu, chi, chi, chi” as they come ashore. Undeterred by night snowfalls or freezing cold, they push on toward their destination, lured by whispers of love in the sedge everywhere. They number in the thousands, tens of thousands. This frantic nocturnal activity goes on until late March. As young shoots begin to emerge in the vegetation in mid-March, egg-laying begins in shallow depressions dug under the *higesuge* roots, as well as at the base of other shrubs and behind rocks.

Each egg of the two-egg clutch weighs 45 g, totaling 90 g for the clutch weight, close to half the 206-gram weight of the parent, certainly a heavy load of eggs for the mother to produce. The egg shape is elongated, as if to prevent rolling. Color is extremely varied, but the eggs are like riverbed stones in overall appearance, with mixed spot sizes giving them a camouflage effect. The second egg is laid between the second and 12th day after the first egg, average 6th day. Many bird species lay an egg every day, but a 6-day spacing is not unusual for a species with such heavy eggs. During the first part of April the male and female parents share incubation duties around the clock. Incubation takes place from the 3rd day after the second egg is laid to the 12th day, average 6th day.

Once they have begun to incubate, parents retain resolute devotion to the



抱卵中の海雀並にその巢と卵

Ancient Murrelet nest and eggs during incubation

task, serenely continuing to brood the eggs in spite of wind and rain. Even if touched by a human hand they stay on the nest, or if they do leave the nest, they remain nearby. If there appears to be a threat to the eggs, they instinctively adapt to the situation admirably, and smear the eggs with foul-smelling liquid feces for protection. Incubation lasts 26 to 40 days, average 32 days, until the time when a cute chick breaks through the shell and pops out calling, “Chi, chi, chi, chi.”

After departure time, no one has ever seen the chicks swimming around the island with their parents. No one knows where they go at sea. Adults and chicks were often released to the sea by light keepers.

As parents launch chicks to the sea, they separate from each other, with the chicks showing no yearning for parental companionship, going off independently, swimming and diving, and heading further and further out to sea. The parents likewise, with a horse-like determination, charge out into the water.

In an experiment observing over 10 groups of chicks on their way out to sea, almost all went about swimming and diving independently, making no contact with other individuals. Only two individuals in one group stayed together, chattering and maintaining close contact as they swam away. Thereafter, the Chilbal-do adults and chicks spend their time at sea, perhaps along the coast of Korea or along the Yellow Sea in China, and will then return again as adults early the next spring to assume breeding roles on their home island.

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Original text of "Life History of *Synthliboramphus antiquus*," by T. Ishizawa

海 雀 の 生 活

石 澤 健 夫

海雀はカムチャツカ・コンマンダー群島・アリューシャン群島、日本に於ては千島から朝鮮臺灣地方まで分布して居るが、此蕃殖地は限られて前記の北太平洋地方、日本に於ては千島の外ずつと下つて朝鮮半島の南西の海岸に分布する小島例へば西島、ソバ島、七發島等に蕃殖する。其他の地方に於ては蕃殖期以外の時期にばかり出現する。

海雀は海の鳥で體重は50匁から60匁位あり、體色は背面灰黒色、胸部及腹部は白色で、翼長は181匁、尾羽は短く37匁、嘴峰は13匁、鳩より少しく小形で一見雀に似た様な姿をして居るので、海雀と言ふ名がついて居る。

本記事は橋本秀雄氏が先年朝鮮七發島に滞在されて居たとき、余の依頼に應じて熱

心に觀察されて幾回にも余に報知せられたものをまとめたもので、興味の多い新知識に富む海雀の生活史である。

七發島は小さい島で全島岩石から成り、頂上の平たい所に燈臺があり燈臺守の家族が數人生活して居る許りの極めて寂漠たる孤島に過ぎぬ。全山にはヒゲスゲと言ふ1米に足りぬ禾本類の株が密生し其他數種の小灌木が少し許り生へて居るばかりである。

こんな寂漠たる孤島にも二月下旬頃から海雀が蕃殖のために大群をなして訪れ島の人々に慰安を與へてくれるのである。

二月下旬から毎夜暗くなつてから海雀は群をなして上陸し、ツツツチチと優しい聲で鳴いて居る。雪の降る夜、氷の張る寒

さにもめげず至る所の叢で愛を囁いて居るのである。その數は何千羽何萬羽にも及ぶ程である。これが三月下旬までもつづき島の夜は急ににぎやかとなる。若草の將に萌え出でんとする三月の中旬にはヒゲスゲの根元に浅い凹所を掘り産卵を始める。其他灌木の根元岩蔭等にも産卵する。

一腹分の卵は二個で一個の重量は12匁で

性質敏捷な海雀も一旦抱卵に着手してからは全く無抵抗主義で雨風に曝されながらヂット落付いて抱卵して居る。人が手を觸れても逃げようとしめない。たとへ逃れても巢から遠く去らず卵を取られそうな時には惡臭ある液狀の糞を卵にかけて奪はれるのを防がうとする臨機應變の本能には全く感服させられる。抱卵は26日乃至40日平

あるから二個分は24匁となり親鳥の體重は平均55匁であるから體重の約半分に近い目方の卵を産するわけで實に重い卵である。卵の形は長橢圓形で轉ばぬ様に出来て居り色彩は極めて變異が多いが大體河原の石の様な色で大小の斑紋があり保護色となつて居る。卵は第一卵を産んでから2日乃至12日平均6日目に第二卵を産する。多くの鳥類は毎日一卵づつ産卵するのであるが6日も間を置く事は體重に比しこんなに重い卵を産む鳥として當然な事である。四月上旬には産み揃へ晝夜を分たず雌雄交代に抱卵して居る。第二卵を産してから3日乃至12日平均6日目に抱卵に着手するものである。



抱卵中の海雀並にその巢と卵

均82日も續いて始めて孵化し中から可愛い雛が殻を破つてチチチチととび出て来る。

雛は軟かい綿毛に被はれ頭上は黒色背面はネズミ色下面は白色で一塊の綿の様であるが脚部はよく發達し孵化後しばらくすると巧みに游泳することも出来るし歩行することも出来る。體重は平均8匁あり卵殻は1匁あるから孵化直前の卵は新鮮なる卵よりは3匁ばかり軽いわけである。2卵は同日か1日の差で孵化し一兩日親鳥に温められてから夜間親鳥に引き連れられて鳥を去り翌春まで鳥には歸らない。かくして五月下旬には全部巢立し6月上旬には一羽も見ることが出来なくなるのである。

其後親鳥や雛鳥が鳥の近くに游泳して居るのを見た人も無く一體何處に行くものか一向判らない。何回も親と雛とを一所に海面に放つてやつたが親子別々に雛は親を慕はず勝手にアチコチを泳廻り又水を潜り沖へ沖へと行く。親も子の事等我關せず焉と言つた様子でドシドシ沖へ行つてしまふ。雛同志に於ても十數組の試験の中多くは雛同志睦み合つて行く事なく各自勝手氣儘に泳ぎ又は潜り廻るが只一組だけ二羽は終始相竝んで睦まじく鳴き合ひながら沖を指して泳いで行つた。かくして七發鳥を去つた海雀は親子別々に生活し恐らく朝鮮や支那の沿岸地方(黃海地方)を漂行し翌年の早春雛は一人前に成長し生れ故郷の七發島へ蕃殖を営むために又歸つてくるものであらう。

ON THE RECORDS OF THE MARBLED MURRELET (*Brachyramphus marmoratus*) IN THE RUSSIAN FEDERATION

Yu. B. Artukhin

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Brachyramphus marmoratus) is an American representative of the genus *Brachyramphus*, which has recently been granted the status of an independent species as a result of separation from the Asian form, the Long-billed Murrelet (*B. perdix*) (Friesen et al. 1996). In the bird list of the Russian Federation, the Marbled Murrelet is enlisted because of two sightings on the Chukotsk Peninsula, registered in the beginning of 20th century. Both observations are from J. Koren, who used to collect birds in Northeast Asia in the 1900s to 1910s.

The first sighting occurred during Koren's travel from Alaska to Chukotka in June–August 1909 on the boat *Teddy Bear*. On 29 June 1909, next to Idlidlya Island (67° 03' 06" N, 172° 46' 54" W), located east of Kolyuchin Bay, he observed a pair of "Marbled Murrelets" and took the male bird. He has reported about this in the description of his expedition (Koren 1910). After this observation, it was included in a report of A.C. Bent (1919) about birds of North America, and *B. m. marmoratus* has been included in the fauna of the Soviet Union (Buturlin 1934). This record of the Marbled Murrelet on the Asian coast is figuring in all avifaunistic reports of Russia (Dementiev 1951, Ivanov et al. 1953, Kozlova 1957, Stepanyan 1975, 1990, 2003; Ivanov 1976, Shibaev 1990, Koblik et al. 2006). The only doubts about Koren's finding were given by L.A. Portenko (1973), but he let Marbled Murrelet to stay in the Chukotka list of birds, since he did not have a chance to examine the obtained specimen.

In February 2010, R. Day (ABR, Inc.—Environmental Research and Services) caught my attention with a specimen of Kittlitz's Murrelet (*B. brevirostris*) in the collection of Field Museum of Natural History, Chicago (FMNH, collection number [coll. #] 126291),

obtained from the Asian coast at a place with the non-understandable name "Kolittjan Is" Looking at the details of this find has given me the thought that this is exactly the male Marbled Murrelet collected by Koren on 29 June 1909 next to Idlidlya Island. I received evidence of this from the collection manager, D. Willard, who told me that according to the original label, this specimen was initially determined by Koren as Marbled Murrelet; and the place of the find, "Kolittjan Is" in the collection catalogue, as was found out, was incorrectly interpreted from hand-written name of Idlidlya Island in English. (In his 1910 publication Koren has listed it as "Idlidlja"). It is not known who has made the re-determination of the specimen, but it was included in the Chicago museum L.B. Bishop's collection as a Kittlitz's Murrelet.

Now, it is quite difficult to explain how Koren could make such a mistake. It is known that he was an excellent observer and knew birds of the north well (Thayer and Bangs 1914). One possible reason is that during the first season of work, Koren did not figure out which species of murrelets lived on the Chukotka coast. That was the only observation of murrelets during the summer trip of 1909, and this find of Kittlitz's Murrelet was one of the first for Chukotka. Before Koren, this species was registered here only on 22 June 1879 in the Chukchi Sea, next to the former village of Pitlekay (Palmen 1887) and on 4 June 1908 at the Diomede Islands (collection by A.H. Dunham, FMNH, coll. # 137234 and # 137235). During the next seasons of work in Chukotka, Koren observed and obtained Kittlitz's Murrelets frequently (Thayer and Bangs 1914).

E.V. Kozlova (1957) published notes about the second observation of Marbled Murrelets in the USSR and reported, with the reference to Zoological Institute

(ZIN) of the Academy of Sciences of the USSR, that it was obtained during migration on 19 May (year not shown) next to the Diomede Islands in the Bering Strait. After I noted that this information was ignored by L.A. Portenko (1973) in his monograph about birds of Chukotka, I requested the details of this find from V.M. Loskot, the curator of the Ornithological Department of ZIN, Russian Academy of Sciences (RAS). He wrote me the following answer: "In the collection of ZIN RAS we have the skins of definite male and female *B. marmoratus* (coll. # 5028/278-933 and # 5029/278-933), which were deposited in the Institute on 26 August 1933 from James Lee Peters, as a result of a collection material trade between the Museum of Comparative Zoology, Cambridge, Massachusetts and ZIN RAS. Those birds were obtained by John Coran [an alternate spelling of Koren], collector in "The John E. Thayer Expedition of 1910-11," on 19 May 1910. Each specimen had 3 labels: (1) Original label of collector J. Coran; (2) Label of the collection's owner—J. Thayer; (3) standard label of ZIN RAS. In the first label there is a note, made by Coran's hand, that the place of collection for both specimens was "Dundas Island B.C.," i.e., it is explicitly Island of Dundas, British Columbia, Canada (54° 33' N, 130° 53' W). However, Thayer's label does not mention this island as a place of finding, but mentions "Diomedes Id. B.C." Maybe this change happened because of handwriting the letter "u" by Coran, where he made a superscript sign, like in Russian "и", and during reading "Dundas" turned into "Diomedes". When the 3rd institutional label was written, Thayer's version was transformed into "Diomede Islands, Bering Strait". And that was used by E.V. Kozlova (1957), she did not pay attention at letters "B.C." (= British Columbia) on both

initial labels. L.A. Portenko noticed this mistake first and wrote the correct name of the finding place with blue ink on the institute label: “Dundas Island, British Columbia”.

The “American” background of those specimens is also confirmed by other collections of Koren’s from British Columbia, from 8 May till 1 June 1910 (see the catalog of ornithology collection of Museum of Comparative Zoology, at Harvard, on the website <http://collections.mcz.harvard.edu>). Samples of *B. marmoratus* from the collections of ZIN refer to the same period of time. Later, in the summer of the same year, Koren continued to collect birds on Chukotka.

Unfortunately, L.A. Portenko did not comment on the wrong information published by E.V. Kozlova. As a result, this wrong information is still getting republished (Stepanyan 1975, Sealy et al. 1982, Shibaev 1990, Nelson 1997, Koblik et al. 2006, Nechaev and Gamova 2009).

By this means, both registrations of Marbled Murrelets in the territory of Russia must be considered as mistakes. At the same time, it is impossible to exclude completely the possibilities of the appearance of this species in the far Asian northeast, considering observations at the northwestern end of St. Lawrence Island, 50 km from the Russian-American border (Bedard 1966). However, the most probable region in which the Marbled Murrelet would be located is the Commander Islands, which are 340 km west of the border of this bird’s range, which is Attu Island, Aleutian Islands (Gibson and Byrd 2007). There was also a hypothesis about *B. marmoratus* nesting at Medny Island [in the Commanders group] (Carter and Sealy 2005). Indeed, there are 3 records of “Marbled Murrelet” from the Commander Islands (Hartert 1920, Kartashev 1961, Artukhin 2002), but a bird was collected only in the first case. This sample (American Museum of Natural History, New York, coll. # 748164) belongs to the Asian and not to American form; the accuracy of this determination was confirmed by curator of the collection P. Sweet, and photos sent

by him. So, residency of *B. marmoratus* on the Commander Islands has not been proven yet.

To my mind, all the above information can be sufficient for exclusion of *B. marmoratus* from the bird list of the Russian Federation until there are reliable observations of it in this territory of the country.

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RE-EVALUATION OF THE CLUTCH OF THE LONG-BILLED MURRELET *Brachyramphus perdix* FROM THE COMMANDER ISLANDS

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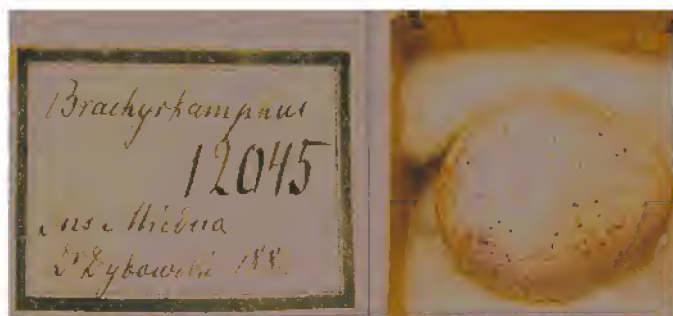


Figure 1. The egg from B. Dybowski's findings at Medny Island, Commander islands (MIZ coll. #49591). Photo by D. Mierzwa.

Famous Polish zoologist Benedykt Dybowski, while working on Kamchatka (1879–1883) as a local doctor, visited the Commander Islands several times. Ornithological collections gathered during that time were sent by him for processing to W. Taczanowski at Warszawa University. At the present time they are stored in the Museum and Institute of Zoology, Polish Academy of Sciences (MIZ). In Dybowski's collections from the Commander Islands there is an egg of the Long-billed Murrelet *Brachyramphus perdix*. Its description was included by Taczanowski into the second part of his report about birds of Eastern Siberia (Taczanowski 1893: 1213): "The egg, collected by Dybowski at Medny Island, is very similar to one of *Syntliboramphus antiquus*, but it is slightly thicker. The background is yellowish, pretty pale, covered all over the surface with little slate-like grey stains and other numerous surface stains and red-brownish dots that form a crown around the dull end. The shine is the same like of the mentioned bird. Size 62.5 x 41.2 mm".

According to A.P. Kuzyakin (1963), the author of the first documentarily confirmed finding of the Long-billed Murrelet nest, reliability of Taczanowski's

reports, only G.P. Dementiev (1951) has included a description of this egg. Conclusions of researchers abroad are contradicting: some of them think that this egg could belong to another species (Day et al. 1983); others recognize the Dybowski's finding as the first known nest of *B. perdix* (Carter and Sealy 2005).

In order to figure this question out, I asked the chair of ornithological collection of MIZ, T. Mazgajski, to send me the photos of the egg and tell me the details of its finding. It is known (Mlikovský 2007) that part of the Warszawa museum's collection was lost in the first half of 20th century, but collections of Dybowski were saved, including the egg I was interested in (MIZ collection number [coll. #] 49591). Judging from the label (Figure 1), it was found on Medny Island "Ins. Miedna" in 1882. The species it belongs to was not determined, the name contains only its genus *Brachyramphus*. I do not have any information about the author who made the determination.

Why has Taczanowski attributed this egg exactly to *B. perdix*, even though he emphasized its similarity with Ancient Murrelet? Obviously, the grounds for that was the accompanying information on the label about the egg belonging

determination is so insignificant that, for instance, E.V. Kozlova (1957) has not even mentioned about it in her monograph about auks. Yu.V. Shibaev (1990) has not paid his attention to this finding either.

Among Russian

to *Brachyramphus*. Kamchatka collections of Dybowski contain 3 specimens of *B. perdix* (all in breeding plumage, described in Taczanowski's report [1983:1213]), and one specimen of the Kittlitz's Murrelet *B. brevirostris* in winter plumage (MIZ coll. # 33509). For all of them, the place of discovery is mentioned to be "Kamczatka" with no date, except one study skin of *B. perdix* from 17 June 1881. The choice of *B. perdix*, based on these collections, seems to be quite appropriate. However, it seems strange that in the avifaunistic list of Kamchatka and Commander Islands (Dybowski and Taczanowski 1884), among birds registered on Bering and Medny islands, there are no *Brachyramphus* murrelets—these species are only mentioned for Kamchatka. The same situation was repeated in the edited and more completed list which was published after 40 years (Dybowski 1922). I assume that the authors had doubts about accuracy of this egg, which, along with the absence of birds collected from the Commander Islands, decided them not to include representatives of genus *Brachyramphus* in the list of avifauna of the islands.

Which species did the Dybowski's finding belong to? Among auks found in Kamchatka region and on adjacent territory, only Ancient Murrelets have eggs that look very similar to those of *Brachyramphus* murrelets. The cases of inappropriate determinations of historical findings of those birds arise from that (Carter and Sealy 2005, 2010).

Among those species, only the Ancient Murrelet is nesting on the Commander Islands (Artukhin 1991). The Long-billed Murrelet was only once recorded there (Hartert 1920); assumptions about its nesting (Konyukhov and Kitaysky 1995;

TRANSLATION • Re-evaluation of Long-billed Murrelet from Commander Islands

Artukhin 2002) are hypothetical. The residency of the closely related American species—Marbled Murrelet *B. marmoratus*—is possible, but their presence has not been proven yet for these islands, as well as for the entire North-East of Asia (Artukhin 2011). The Kittlitz's Murrelet was remarked only once on the adjacent marine area (Artukhin et al. 2001).

Specific characteristics of coloration and changes in egg sizes are studied the least for the Long-billed Murrelet. There are only 4 egg descriptions known, 2 of which were extracted from oviduct of females (see Table 1). They all had blue-greenish or green-bluish background and tiny surface stains of different brown shades. Marbled Murrelet eggs have varying coloring of background, from light olive-green to green-yellowish (Nelson 1997). The background of eggs of Kittlitz's Murrelets is usually either

olive-green (sometimes green-yellow) or yellowish (Day et al. 1999; Kaler et al. 2009). The shape of *Brachyramphus* eggs is sub-elliptical elongated.

The Ancient Murrelet is the more well-studied species and its egg characteristics vary along a wide spectrum. Judging from size, there is geographical variability: the smallest eggs exist on southern borders of their range, on both sides from Pacific (Table 1). The background of the shell varies from pure white to average-brown, sometimes bluish, and often contains shades of leather-like brown. Surface fulvous or brownish small spots, as well as deeper greyish spots, are uniformly distributed or become denser at the dull end. Egg shape varies from elliptically oval (with non-emphasized difference in rounding of the ends) to elongated egg-like (Kozlova 1957, Shibaev 1990, Gaston 1992; Figure 2).

After comparing the photo and description of Taczanowski with information obtained from different sources, including information from experienced researchers of auks, we can make the conclusion that this egg does not belong to the Long-billed Murrelet, but to the Ancient Murrelet. The reason is the set of characteristics most closely match the characteristics known for *Synthliboramphus*; however, the sum of those characteristics does not match any of the *Brachyramphus*. That's why Taczanowski had pointed out the similarity of the egg with the Ancient Murrelet egg. Probably he was comparing it to the 2 egg samples of that species that he possessed (Taczanowski 1893: 1216).

The egg size slightly exceeds the average values from different regions; however, those sizes are in between the limits of variability (Table 1). The breadth



FIGURE 2. Variations of Ancient Murrelet eggs, Talan Island, the N Sea of Okhotsk. Collections by E.Yu. Golubova, photos by A.V. Kondratyev.

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TABLE 1. Egg size (mm) in the genus *Brachyramphus* and in *Syntliboramphus antiquus*.

Region	Locality	n	Length		Breadth		Source
			Mean	Range	Mean	Range	
<i>B. perdix</i>							
East Asia	Okhotsk town	1	63.6	—	39.3	—	Kuzyakin 1963
	Okhotsk town area	1	63.0	—	38–39	—	Yakhontov 1979
	Sakhalin Island	1	66.2	—	39.0	—	Nechayev 1991
	Kamchatka		56.2	—	39.3	—	Konyukhov and Kitaysky 1995
<i>B. marmoratus</i>							
USA, Canada		11	59.8	57.0–63.0	37.6	35.0–39.5	Nelson 1997
<i>B. brevirostris</i>							
Alaska, NE Asia		13	60.2	55.0–63.8	37.3	30.0–40.6	Kaler et al. 2009
Aleutian Isls.	Agattu Island	9	57.2	54.7–60.4	38.1	35.0–40.9	
<i>S. antiquus</i>							
N. Sea of Okhotsk		283	62.0	50.3–69.4	38.8	32.4–48.2	Golubova 2011
S. Primorye		72	60.0	56.4–63.7	36.5	35.9–40.3	Shibaev 1990
Kuril Islands		7	61.1	—	38.4	—	Gaston and Jones 1998

of the egg seems to be large, but indeed the shape must be more elongated than in picture, since the egg shell had cracked across and is pictured with its halves overlapping.

From Taczanowski's description, the color of the egg background is yellowish. Judging from the photo it is closer to yellow-brownish (leather-like brown)—color d4 from the scale of A.S. Bondartsev (1954). Brown shades in the background of the eggs shell belong to *Syntliboramphus*, but not to *Brachyramphus*. Color, dimensions, and the amount and pattern of distribution of deep and surface spots also suit the Ancient Murrelet (Figure 2).

The additional fact is the commonness of Ancient Murrelets during summer at Medny Island when Dybowski was visiting (Stejneger 1885). However,

strictly speaking, the status of this species breeding on the Commander Islands is still based only on non-direct proof. Among them, there is an observation of adult birds during the breeding season, as well as night vocalizations on the shore in bird colonies (Stejneger 1885, Hartert 1920, Artukhin 1999, Klyonova and Shienok 2012), S.V. Makarov's finding of deceased juvenile bird (Zoological Museum, Moscow State University coll. # 85538), and often remains of the birds found near dens of Arctic Foxes *Alopex lagopus* (Shienok 2011). Considering the finding of Dybowski to be Ancient Murrelet, we recognize it as a first documented evidence of the species nesting on the Commander Islands.

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BOOK REVIEW

ATTENDING ALASKA'S BIRDS: A WILDLIFE PILOT'S STORY.

By James Gore King, with foreword by Jim Rearden. Hancock House Publishers (Blaine, Washington), 2010; originally published by Trafford Publishing, [www/trafford.com](http://www.trafford.com), 2008.

Reviewed by Christian Dau

Jim King is a biologist and pilot who surveyed and managed waterfowl for the U.S. Fish and Wildlife (USFWS) from the early 1950s to 1983. This career is the focus of his book, along with accounts of Alaska's landscape, people, and challenges. However, when Jim encountered the wealth of seabirds along Alaska's coasts, he became an early advocate for seabird studies and a founder of the Pacific Seabird Group. PSG honored him with its Lifetime Achievement Award in 1997, along with our co-founders W.R.P. Bourne and Jim Bartonek (*Pacific Seabirds* 24(2): 51-57, 1997).

Jim recounts his involvement with seabirds in Chapter 9. During a flight along the coast of Bristol Bay in the mid-1960s, he was astonished to see the huge colonies at Cape Newenham. Shortly afterwards he flew along the Aleutian Islands (to survey marine mammals) and saw many more colonies. Yet on the same flights he also saw oil pollution, fishing fleets, and shipwrecks—and on the horizon (metaphorically) was large-scale oil exploration. At the time there had been almost no inventories of Alaskan seabird colonies or populations, nor was anyone assessing threats to them.

Jim initiated aerial surveys of birds at sea in southwestern Alaska, in collaboration with Jim Bartonek and Karl Kenyon. They wrote papers on the global importance of Alaska's populations, and Jim was able to get Cape Newenham designated as one of Alaska's first national wildlife refuges (NWR).

He goes on to chronicle dramatic advances in Alaskan seabird work from the early 1970s. In anticipation of oil and gas exploration, the US government

funded research in Alaskan waters via the Outer Continental Shelf Environmental Assessment Program (OCSEAP). Hundreds of biologists were hired to start studying seabirds. King's colleagues Jim Bartonek and Cal Lensink led the work on locating colonies, estimating populations, monitoring productivity, and assessing threats.

Better communication among the new seabird biologists was also essential. Jim was in touch with Bill Bourne in Scotland. When Jim visited that country in 1971, they discussed the need for a new professional group in North America, along the lines of the Seabird Group that Bill had recently established in the UK. In early 1972, King and Bartonek declared themselves the first two members of a new Pacific Seabird Group. That same fall they introduced the idea at a conference of the Western Society of Naturalists, to enthusiastic reception. The next steps were to assemble a mailing list, start publishing a bulletin, and arrange PSG's first annual meeting (in 1974). Being a good administrator, Jim assigned these tasks to his new assistant, George Divoky, and "the rest is history." Jim himself went back to being a waterfowl biologist—but he remained active in PSG for several years, presenting papers at PSG meetings and even editing the *PSG Bulletin* (now *Pacific Seabirds*) in 1978–1979.

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Most of Jim's book is a warm and readable account of his career monitoring Alaska's 12 million breeding waterfowl. The book chronicles Jim's various careers, with occasional retrospectives

on the lifelong process of gaining the knowledge necessary to "attend Alaska's birds." Poet/essayist Samuel Johnson declared, "There has rarely passed a life of which a judicious and faithful narrative would not be useful." This seems especially true of Jim King, who continues to be useful and productive. However, he is also quick to acknowledge his numerous mentors and collaborators.

Jim begins the narrative with a history and pilot's travelog of the northern Gulf of Alaska coast. He then goes back to the beginning of his resource work in Alaska—a year-by-year process that required patience and persistence to gain an understanding of Alaska's birds and habitats. He stresses the value of basing one's opinions on knowledge, including a historical perspective. His early work was mentored by pioneers in the territory of Alaska, as they worked on the "birth of game management" before statehood.

Waterfowl banding in Alaska moved from its infancy to large-scale programs during the author's early career. Techniques had to be developed for logistically and environmentally challenging areas. Local Native people provided expertise and participated in banding, which facilitated an atmosphere of rapport and trust. King and his colleagues discovered that waterfowl bands they applied in Alaska were being recovered throughout North America and in Asia; the data showed that Alaskan populations were of national and international importance. Their information was instrumental in getting new refuges and other conservation lands established throughout the state.



## BOOK REVIEW • *Attending Alaska's Birds*, by Jim King

A major part of waterfowl management is the annual statewide (and continent-wide) aerial survey of breeding waterfowl pairs. One of the observers is always a biologist who doubles as pilot. Jim's career proceeded from Game Agent and Warden through his training and appointment as Wildlife Pilot. He praises the encouragement and unfettered freedom that he received to develop the work and explore. In turn, he encourages today's biologist-pilots to think broadly about geographic, habitat, and biological relationships. He gives an interesting overview of how the USFWS aircraft fleet developed, and how the approaches and challenges of management changed as resource agencies grew.

The delta of the Yukon River in far western Alaska is a mosaic of ponds and tundra and supports millions of waterfowl. In 1960, Jim accepted a major career change to become manager of the Clarence J. Rhode NWR. From the new office in Bethel, Jim worked to develop cooperation with the Yup'ik people of the town and the nine villages in or near the refuge. Jim's efforts paved the way for subsequent managers to continue working with local people.

The refuge was named for a USFWS supervisor who perished in August 1958 when his aircraft crashed in the Brooks Range. Jim describes his participation in what was then the largest search effort in Alaska's history. The search was unsuccessful, although hikers found the wreckage 40 years later. In 1980 the refuge was expanded and renamed Yukon Delta NWR.

The author left his refuge career in 1964 to become chief of Waterfowl Investigations, following in the footsteps of his mentor and friend Henry A. Hansen. Jim's job was to oversee the Alaska-Yukon portion of the breeding pair survey. Data from the survey are required for annual population management, including bag limits for waterfowl hunters. In addition, the information is used in resource planning and in agency responses to development proposals. Further, the surveys eventually influenced

the establishment of protected conservation areas. All this underscores the importance of collecting long-term data, which happened through the foresight and persistence of Jim and his colleagues.

Always one to learn about another species, Jim participated in aerial population surveys of Bald Eagles (*Haliaeetus leucocephalus*) in southeastern Alaska. He and Fred Robards collaborated on protocols for these surveys. He was involved in research and habitat management for the species, and he assisted in the designation of Admiralty Island National Monument and the Alaska Chilkat Bald Eagle Preserve. The book details the lengthy process of educating federal and state agencies and the public about eagles; their persistence makes inspiring reading. Jim's account includes the establishment of the American Bald Eagle Research Institute, in collaboration with the University of Alaska-Southeast in Juneau. Jim can take pride in his contribution to moving the Bald Eagle from a bounty species prior to statehood to a protected species today.

Back with waterfowl, the author presents the history of swan surveys in Alaska, from local studies in the 1950s to the statewide aerial inventories of today. Early work progressed to the development of Pacific Flyway management plans for both Tundra and Trumpeter Swans (*Cygnus columbianus* and *C. buccinator*). His story provides valuable historical insight for today's biologists and managers. Jim recounts his decades of support and active participation in the Trumpeter Swan Society, and the group's successful efforts to restore swan populations in some of their historic range.

Jim describes his instrumental role in the federal statutes that have shaped Alaskan land ownership and the economic status of Alaska Natives for the past third of a century: the Alaska Native Claims Settlement Act (ANCSA; 1971), and the Alaska National Interest Lands Conservation Act (ANILCA; 1980). ANILCA, which established new refuges and other conservation units, is an important hallmark of his career. The author's experiences impress on the reader how

the expertise of many Alaskans, in addition to their untiring behind-the-scenes efforts, influenced the decisions of Congress and the President.

Jim has involved himself in many other local, state, and national, conservation efforts. He credits his family with roles in establishing and refurbishing local trails and parks. They worked to convince politicians that public-use areas should be appreciated and protected (there were plenty of political hurdles), and to generate public support. The author's wife, Mary Lou King, began the SeaWeek project, a local environmental education program. Other educators statewide have adapted this tool for use in their own areas. Residents of Juneau will particularly enjoy this history.

Jim and Mary Lou have also attended to Alaska's birds in a hands-on way. He describes their waterfowl husbandry and behavior studies at the "Family Bird Farm" in Juneau. This labor of love has added "waterfowl behaviorist" to Jim's specialties, in addition to promoting environmental education.

Jim's final two chapters might be viewed as a synopsis of his retirement and a summing up of his career(s). But, unlike General MacArthur, who lamented that "old soldiers . . . just fade away," the author has seemed to gain momentum and remains a voice to be listened to. The book is all about his work, past and present, and his visions for the future. Throughout he recognizes many notable mentors and colleagues; their fruitful careers exemplify the importance of encouragement and friendships. Jim provides glimpses of his role as mentor to fledgling biologists; he continues mentoring—and it's contagious.

Benjamin Franklin wrote, "If you would not be forgotten, . . . either write things worth reading or do things worth writing." Not for himself, but to "attend Alaska's birds," the author has done both of these admirably.

**Christian P. Dau**, U.S. Fish and Wildlife Service, Anchorage, is among the waterfowl biologists whom Jim King has mentored.



## REGIONAL REPORTS FOR 2013

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Regional Reports summarize current and recent seabird work of interest to PSG members. Regional Reports generally are organized by location of the work, not by affiliation of the biologist. They should not be cited without permission of the researchers. Please note that these reports refer to work through September 2013; subsequent work will be reported in *Pacific Seabirds* 41.

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### ALASKA

Compiled by **Adrian Gall**

#### ALL ALASKA AND ARCTIC OCEAN

**Heather Renner** and **Marc Romano** (U.S. Fish and Wildlife Service [USFWS], Alaska Maritime National Wildlife Refuge [AMNWR]) worked with many partners on a status assessment for Aleutian Terns (*Sterna aleutica*), a population that appears to have declined by 80% in recent decades. Twenty-three colonies statewide were opportunistically surveyed in 2013, using a standardized protocol.

In 2013 **Falk Huettmann** (Ecological Wildlife Habitat Analysis of the Land and Seascape [EWHALE] lab, University of Alaska Fairbanks [UAF]) and his collaborators worked on an Arctic Shipping assessment, based on the predicted distributions of 27 seabird species for the entire Arctic. The findings show that the Arctic, specifically the shelf region, is already highly overcommitted, and that many essential shipping regions overlap with seabird and colony hotspots.

UAF is now transitioning into DSpace ([www.dspace.org](http://www.dspace.org)) as their institutional data repository, and the EWHALE lab plans to make their data available through this repository for public access and download (stay tuned!). (For Falk's work in the Atlantic and Antarctic, see regional reports for those areas.)

#### BEAUFORT AND CHUKCHI SEAS

**Kathy Kuletz** and **Liz Labunski** (USFWS) completed the final year of a 4-year pelagic seabird survey in the Beaufort, Chukchi, and north Bering seas. The work is part of the Seabird Distribution in the Offshore Environment project, funded by the Bureau

of Ocean Energy Management (BOEM). In 2013 they placed observers on six arctic research cruises; they lost a seventh cruise due to the government shutdown. The 2013 observers were **Raymond Buskirk**, **Terry Doyle**, **Kathy Kuletz**, **Liz Labunski**, **Catherine Pham**, **Pat Pourchot**, **Martin Reedy**, **Martin Renner**, **Declan Troy**, **Charlie Wright**, and **Tamara Zeller**. Data from all the at-sea surveys will be archived in the North Pacific Pelagic Seabird Database.

Results of the USFWS Arctic surveys are being contributed to two synthesis efforts. The first effort integrates the seabird data with three other components of the BOEM-funded Synthesis of Arctic Research (SOAR), led by **Sue Moore** (National Oceanic and Atmospheric Administration). For one of the SOAR projects, Kathy and Liz teamed with **Brendan Hurley** (George Mason University), **Adrian Gall** (ABR, Inc.—Environmental Research and Services [ABR]), **Bob Day** (ABR), and others to examine seabird distribution in the Chukchi Sea. The second synthesis effort is the Pacific Marine Arctic Research Synthesis (PacMARS), led by **Jackie Grebmeier** (Chesapeake Biological Laboratory) and funded by NPRB.

**Adrian Gall** and **Bob Day** (ABR) completed the sixth field season of boat-based seabird surveys in the north-eastern Chukchi Sea in 2013. The crew included **Adrian**, **Kristen Gorman**, **Corey Grinnell**, **John Rose**, and **Peter Sanzenbacher**. It was a challenging field season, with lots of persistent ice and very few birds to entertain the observers. These surveys are part of the Chukchi Sea Environmental Studies Program (CSESP), an interdisciplinary oceanographic study that collects data

concurrently on physical and biological oceanography, benthic ecology, fisheries, contaminants, marine mammals, and seabirds 60–100 nm (110–185 km) offshore from the village of Wainwright. The first round of papers from this study was published in a special issue of *Continental Shelf Research* (No. 67) in 2013. This study is funded jointly by ConocoPhillips, Shell E&P, and Statoil. More information is available at the project website <http://www.chukchiscience.org>

**Adrian Gall** made a pit stop at the Alak School in Wainwright on her way out to the ship, to participate in a Marine Science Day. Representatives from each discipline involved in CSESP set up stations in the gym to introduce students from grades K–12 to the wonders of benthic marine animals, zooplankton, marine mammal acoustics, physical oceanography, and of course seabirds. Adrian took some inspiration from materials that the Seabird Youth Network has available on their website ([www.seabirdyouth.org](http://www.seabirdyouth.org)) to develop her station activities. When in doubt, always pack along your study skins. The comparison of the kittiwake and murre-on-a-stick was a huge hit.

**Don Dragoo**, **Heather Renner**, and **Greg Thomson** (AMNWR) collected data on populations of Common Murres (*Uria aalge*) and Thick-billed Murres (*Uria lomvia*), and populations and productivity of Black-legged Kittiwakes (*Rissa tridactyla*) at Cape Lisburne.

#### BERING SEA AND ALEUTIAN ISLANDS

Annual seabird monitoring at St. George and St. Paul islands was led by **Marc Romano**, with summer-long field crews consisting of **Greg Thomson**, **Leslie Slater**, and **Andy Ganick** (St. Paul), and **Matt Klostermann**, **Malory St. Pierre**, and **Naira de Gracia**

## REGIONAL REPORTS FOR 2013 • Alaska

(St. George). Both crews collected data on a variety of species including Red-legged Kittiwakes (*Rissa brevirostris*), Black-legged Kittiwakes, Least Auklets (*Aethia pusilla*), Common Murres, and Thick-billed Murres.

**Rachael Orben** has completed her field work on the winter distribution and ecology of Black-legged Kittiwakes, Red-legged Kittiwakes, and Thick-billed Murres that breed in the southeastern Bering Sea. Her thesis work is part of a large project funded by North Pacific Research Board (NPRB) that is spearheaded by **Dave Irons** (USFWS) and **Dan Roby** (US Geological Survey [USGS] and Oregon State University [OSU]).

**Ann Harding** (Auk Ecological Consulting) has been working on a seabird-focused educational outreach program on the Pribilof Islands. The Seabird Youth Network is a partnership between the Pribilof School District, St. George Traditional Council, St. Paul Tribal Government, the St. George Institute, and the wider scientific community. The Network held summer camps on both St. George and St. Paul, where students learned about seabirds through hands-on experience and active data collection. Collaborators included AMNWR, and scientists from UAF and the University of Alaska Anchorage. For more details on the program, please visit the project website and blog [www.seabirdyouth.org](http://www.seabirdyouth.org)

**Ed Weiss** (Alaska Department of Fish and Game) managed the monitoring of Black-legged Kittiwake, Common Murre, and Pelagic Cormorant (*Phalacrocorax pelagicus*) populations and productivity at Round Island, Alaska, within the Walrus Islands State Game Sanctuary. The field crew, including **Ryan Morrill** and **Ben Hestand**, collected data during 15 May–15 August 2013.

**Kathy Kuletz** and **Liz Labunski** completed the final year of a 4-year pelagic seabird survey in the Beaufort, Chukchi, and north Bering seas, as part of the Seabird Distribution in the Offshore Environment project (see the Beaufort and Chukchi section, above). Among other locations, eight at-sea

surveys funded by USFWS were conducted between April and October in the Aleutian Islands. Kathy also continued working with others on publications based on research conducted as part of the Bering Sea Ecosystem Project (field work conducted in 2008–2010).

**Ian Jones** (Memorial University, St. John's, Newfoundland) led geolocation studies on Whiskered, Crested and Parakeet auklet (*Aethia pygmaea*, *A. cristatella*, *A. psittacula*) at Buldir Island. His team included graduate students **Carley Schacter** and **Katherine Robbins**, along with assistants **Chelsey Stephenson** and **Mark Dodds**. **Heather Major** (University of New Brunswick) and Ian conducted additional auklet investigations on Gareloi Island, together and independently, with assistance from **Katy Gibbs**.

**Robb Kaler** and **Leah Kenney** (USFWS) continued monitoring of Kittlitz's Murrelet (*Brachyramphus brevirostris*) at Adak Island.

**Coral Wolf** and **Stacey Buckelew** (Island Conservation) led a crew of 7 people in the 5th year of post-rat-eradication monitoring on Rat Island, which has now been renamed Hawadax Island. Some species continue to show increases in abundance, now that rats have been eliminated.

**Jeff Williams**, and **Gary Drew** (USGS) led an interdisciplinary team of researchers investigating ecosystem recovery at Kasatochi Island. The volcanic island erupted on 7 August 2008 and destroyed habitat for hundreds of thousands of seabirds.

**John Piatt** (USGS) led a crew of many, collecting Tufted Puffin (*Fratercula cirrhata*) diet samples in the western Aleutian Islands.

### GULF OF ALASKA

**Nora Rojek** (USFWS) coordinated long-term seabird demography monitoring for AMNWR at Chowiet Island, Semidis group, off the southeast coast of the Alaska Peninsula. The summer field crew, **Matthew Henschen** and **Brette Soucie**, worked with

several species including Northern Fulmar (*Fulmarus glacialis*), Black-legged Kittiwake, Glaucous-winged Gull (*Larus glaucescens*), Common and Thick-billed murres, Rhinoceros (*Cerorhinca monocerata*) and Parakeet auklets, and Horned and Tufted puffins (*Fratercula corniculata* and *F. cirrhata*).

At East Amatuli Island in the Barren Islands, **Arthur Kettle** (AMNWR), **Serina Brady**, **Sonia Kumar**, and **Charlie Ylijoki** monitored reproductive success, prey, and population trends of Fork-tailed Storm-Petrels (*Oceanodroma furcata*), Black-legged Kittiwakes, Common and Thick-billed Murres, and Tufted Puffins.

A crew of AMNWR staff (**Leslie Slater**, **John Warzybok**, and **Peter Dunlevy**) briefly visited Sud Island in the Barrens group, as a follow-up to hoary marmot (*Marmota caligata*) eradication efforts conducted in 2011. In addition to looking for sign of marmot presence, the crew examined areas used previously by nesting Rhinoceros Auklets to look for current activity, and they re-photographed vegetation plots established prior to marmot work. **Leslie** also assisted with outreach efforts with Girl Scouts by teaching identification and counting techniques of ledge-nesting seabirds on 60-foot Rock (Kachemak Bay) and Gull Island (western Cook Inlet).

**John Maniscalco** and **Sadie Ulman** (Alaska SeaLife Center) deployed five time-lapse cameras on Barwell Island in Resurrection Bay to record reproductive success of Common Murres.

**Laura Phillips** and **Elisa Weiss** (Kenai Fjords National Park [KEFJ]); **Jennifer Curl** and **Christine Hunter** (UAF, Cooperative Ecosystem Studies Unit); and **Leslie Slater** completed the last year of a 3-year collaborative study. Efforts focused on a comparing survey methods and identifying factors that affect those methods; results will shape the development of a long-term monitoring plan for ledge-nesting seabirds. In particular, Glaucous-winged Gulls were used to test survey methods for abundance estimation, which included boat-based observer counts, boat-based



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photographs, and photographs from a helicopter at multiple colonies within KEFJ and AMNWR. In addition, six time-lapse cameras were deployed throughout the breeding season to examine nest-attendance patterns and detection probabilities during surveys for this species. Historical plots at Black-legged Kittiwake colonies in AMNWR, which were established during studies of the 1989 *Exxon Valdez* oil spill, were also counted and photographed. Finally, a study of the distribution of colonial seabird species using passive acoustics (Song Meter, Wildlife Acoustics Inc.) continued for seabirds in Kenai Fjords that are difficult to detect through visual surveys, such as nocturnal, burrow-nesting Rhinoceros Auklets and Fork-tailed Storm-Petrels.

**Scott Hatch** of the Institute for Seabird Research and Conservation (ISRC) coordinated long-term studies of seabird breeding ecology, life histories, and foraging behavior on Middleton Island. In partnership with **David Irons** (USFWS, Office of Migratory Bird Management), three volunteers (**Jennifer Aragon**, **Erica Lander**, and **Alan Nowlin**) participated in data collection. Other collaborators included: **Kyle Elliott** (Ph.D. candidate, University of Manitoba); **Thomas Merckling** (PhD candidate), **Sarah Leclaire** (Post-doctoral associate), and two field assistants (**Anika Immer** and **Julie Grousseau**) from Université Paul Sabatier (Toulouse, France); and Professor **Sasha Kitaysky** and PhD student **Alexis Will** (UAF). **Lorraine Chivers** (Queen's University, Belfast, Ireland) supervised ongoing studies of birds nesting on and off the Middleton tower, and (with Kyle Elliott) conducted detailed research of known-aged Black-legged Kittiwakes. Her study included offshore foraging (GPS tracking and accelerometry) and parental behavior. Scott and **Martha Hatch** renovated buildings and constructed new seabird nesting habitats. Cold water continued to prevail at sea in 2013; associated with this, availability of capelin (*Mallotus villosus*) to kittiwakes was high, as was their consumption of the fish. The species' breeding performance was very good. All this reflected a pro-

nounced change in the marine regime of the region, which began around 2008.

**Marty Reedy**, **John Warzybok**, **Andy Ganick**, and **Terry Doyle** (USFWS) participated in GOAIERP cruises to record seabirds and marine mammals, following an established grid of transects in the eastern and western Gulf of Alaska.

**Alan Burger** (University of Victoria [UVIC], British Columbia) and his former grad student **Jenna Cragg** (UVIC) completed a study of Marbled (*Brachyramphus marmoratus*) and Kittlitz's murrelets on Kodiak Island, Alaska and are preparing papers for publication.

### SOUTHEAST ALASKA

**Tim Marcella** (MS candidate, OSU), in collaboration with **Daniel Roby** (U.S. Geological Survey and OSU) and **Scott Gende** (National Park Service), are continuing to analyze and summarize results from a 2011–2012 study that investigated cruise ship disturbance to Kittlitz's Murrelets in Glacier Bay National Park. Tim expects to complete his degree requirements in early 2014, with publications to follow shortly thereafter.

The 2013 seabird monitoring crew at St. Lazaria Island consisted of **Amanda Millay**, **Vanessa Curran**, **Rebecca Mostow**, **Nora Rojek**, and **Leslie Slater** (AMNWR), with assistance from **Alexis Will** (UAF). Data were collected for the following:

- Population trends: Fork-tailed and Leach's (*O. leucorhoa*) Storm-Petrels; Pelagic Cormorant (*Phalacrocorax pelagicus*), Glaucous-winged Gull, Pigeon Guillemot (*Cephus columba*), Common and Thick-billed Murres, Rhinoceros Auklet, Tufted Puffin
- Annual productivity: Fork-tailed and Leach's Storm-Petrels, Pelagic Cormorant, Glaucous-winged Gull, Common and Thick-billed Murres, Rhinoceros Auklet, Tufted Puffin
- Chick growth: Fork-tailed and Leach's Storm-Petrels, Rhinoceros Auklet
- Diet sampling: Fork-tailed and Leach's Storm-Petrels, Glaucous-winged Gull, Rhinoceros Auklet.

**Alexis Will** completed the final season of data collection for her graduate work at UAF, with funding from NPRB, as part of the Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP). She is studying Rhinoceros Auklets on St. Lazaria, primarily to learn about adult foraging locations during the breeding season.

**Sadie Youngstrom** (Alaska Department of Fish and Game) checked artificial burrows at Lowrie Island to get a gross estimate of productivity of species known to use the burrows. Species included Fork-tailed and Leach's Storm-Petrels, Ancient Murrelet (*Synthliboramphus antiquus*), and Cassin's Auklet (*Ptychoramphus aleuticus*).

**Jessi Hallman Behnke** (Pacific Rim Conservation, Honolulu, HI) is in the final stages of writing up the results of her master's research in collaboration with **Marjorie Brooks** (Southern Illinois University Carbondale) and **Eric Anderson** (Simon Fraser University). She is investigating inorganic contaminants in Surf Scoters (*Melanitta perspicillata*) and White-winged Scoters (*M. fusca*) in Southeast Alaska and in Puget Sound–Georgia Basin.

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## WASHINGTON AND OREGON

Compiled by **Peter Hodum**

### COLONIES—WASHINGTON

**Scott Pearson** (Washington Department of Fish and Wildlife [WDFW]) continued a long-term study of reproductive success patterns and diet of Rhinoceros Auklets (*Cerorhinca monocerata*) in Washington (WA). His collaborators include **Tom Good** (National Oceanographic and Atmospheric Administration [NOAA], Northwest Fisheries Science Center [NWFSC]) and **Peter Hodum** (University of Puget Sound [UPS] and Oikonos). Study colonies are Protection Island (eighth year), Destruction Island (sixth year) and Smith Island (second year). As in previous years,



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diet on Protection Island was dominated by Pacific sand lance (*Ammodytes hexapterus*). The Destruction Island diet was comprised predominantly of northern anchovy (*Engraulis mordax*) but showed higher diversity than on Protection Island. Preliminary analyses of burrow occupancy and fledging success suggest that both parameters were comparable to previous years on both Protection and Destruction islands.

Undergraduate research students in **Peter Hodum's** lab at UPS, in collaboration with Oikonos, initiated a population monitoring program for Pigeon Guillemots (*Cepphus columba*) in the Tacoma area during the summer of 2013. They mapped breeding colonies, determined reproductive success, and evaluated diet composition.

**Sue Thomas and Lorenz Sollmann** (U.S. Fish and Wildlife Service [USFWS], Washington Maritime National Wildlife Refuge Complex [WMNWRC]) conducted a 4-hour aerial seabird colony survey of 27 islands within Flattery Rocks, Quillayute Needles, and Copalis National Wildlife Refuges (NWRs) on 2 July 2013. Species surveyed included Common Murre (*Uria aalge*); Double-crested, Brandt's, and Pelagic Cormorants (*Phalacrocorax auritus*, *P. penicillatus*, and *P. pelagicus*); and Glaucous-winged, Western and hybrid Gulls (*Larus glaucescens*, *L. occidentalis*, and *L. glaucescens* X *occidentalis*). This survey is part of a larger effort to provide a population index for seabird colonies along the U.S. Pacific Coast. The same survey methodology is followed along the coast of Oregon (OR) and in California (CA). Colonies were surveyed from a 206 B3 Bell helicopter at 700 to 1000 feet above ground level (AGL). The helicopter circled each island or headland until staff captured images of all surfaces where nesting seabirds might be observed. Common Murres were nesting on Erin and Erin's Bride, North Rock, Huntington, Cakesota, Table, and an unnamed island in the northern section of Quillayute Needles; also on Jagged, Carroll Island and Pillar, White Rock, and West Bodelteh. We

are currently counting birds in digital photos via a GIS geospatial database.

**Sue Thomas and Lee Robinson** (retired, USFWS) completed the third and final year of a breeding success study of Pigeon Guillemots nesting in natural cavities on Protection Island in 2013. This project follows methodology established by Lee in a long-term study of breeding success in nest boxes on the island. The information will assist Refuge staff in managing and protecting breeding habitat for this species on Protection Island NWR. This is particularly relevant due to plans for restoration of vegetation in adjacent habitats. In addition, **Sue Thomas and Lorenz Sollmann** conducted an island-wide guillemot survey to determine abundance and distribution of breeding and nonbreeding Pigeon Guillemot on Protection Island, following survey methodology established by Evenson et al 2004 (Proceedings of the 2003 Georgia Basin/Puget Sound Research Conference). Breeding phenology appears to have been 1–2 weeks early; therefore the second year of burrow counts was rescheduled to 2014 due to previous staffing commitments. The goal of these two surveys is to assess distribution and abundance of active guillemot nests island-wide, and to determine the proportion of nonbreeding birds using the island during the breeding season.

**Sue Thomas, Lorenz Sollmann, and Phil Green** (The Nature Conservancy) conducted surveys of breeding seabirds on the San Juan Islands NWR on 8–9 July 2013. This long-term monitoring project began in 1975 to assess species richness and relative abundance of breeding birds, including Pelagic and Double-crested Cormorants and Glaucous-winged Gulls. Each island within the Refuge is circumnavigated once at 2–5 knots from roughly 200 yards (183 m) offshore, depending on currents and obstructions. All adults of any species, as well as chicks and occupied seabird nests, are counted.

**Sue Thomas, Lorenz Sollmann, and Brian Root** (USFWS, Inventory and Monitoring Program) recently completed an assessment of the impacts of Black-

tailed Deer (*Odocoileus hemionus*) activity in a Rhinoceros Auklet colony on Protection Island. The objectives of this study were to assess how frequently deer use seabird nesting habitat during the auklet breeding season, and how much damage the deer cause. The island supports the third-largest Rhinoceros Auklet nesting colony in North America, with approximately 71,000 auklets (Pearson et al, *Condor* 115(2): 356-365, 2013). In addition, a high-density herd of black-tailed deer (124 deer/mi<sup>2</sup>; 47.9/km<sup>2</sup>) are browsing and bedding down in auklet burrow nesting habitat. A study conducted in 2010 (Balbag 2011, unpubl. senior thesis, University of Puget Sound) and 2012 (WMNWRC, unpubl. data) documented damage to auklet burrows. However, there was no temporal aspect to the previous studies, so we could not quantify damage during the auklet breeding season. Frequency of deer use was determined using remote infrared cameras to monitor thirty 5x10-meter plots, which were randomly selected throughout the auklet colony, for two months each. Damage was determined by a thorough assessment of burrow conditions before and after monitoring in a subset of 19 5x10-meter plots. Results will provide baseline data for the development of a deer management plan for protecting seabird nesting habitat on Protection Island. Results are not yet analyzed, but preliminary results suggest that approximately 25% or more of burrows in all plots were damaged during the 2013 breeding season.

**Sue Thomas** teamed up with NOAA's **Ed Bowlby** to test the use of Unmanned Aircraft Systems (UAS) [i.e., drones] for use in monitoring seabird colonies within Flattery Rocks, Quillayute Needles and Copalis NWRs along the outer coast of WA. Objectives included (1) determine the degree of disturbance to wildlife caused by the UAS, and (2) evaluate the quality of video and still frame footage from two types of UAS. The vehicles were a fixed-wing airplane (Puma) and a small helicopter (Quadracopter Md4-1000). Optics on the Quadracopter provide

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higher video quality with a 24-megapixel camera, while the Puma carries a 5-megapixel camera. The units were tested during the last two weeks of June around 15 islands with seabird colonies. Because the Quadracopter has a restricted range (< 0.5 mi) and launch location (land only), as well as being unstable in moderate winds, the Quadracopter was flown for only 1.5 hours. The Puma was operated for 11.5 hours and therefore became the primary unit tested in this study.

Seabird response to the Puma was minimal, with a few mild alert behaviors observed in cormorants and murres at the lowest level of flight (200 feet or 61 m AGL). More often, seabirds were observed landing on the island while the Puma was flying around it. Overall, a similar response was noted in seabirds to the Quadracopter. Species observed include Brandt's, Pelagic and Double-crested Cormorant, Common Murre; Tufted Puffin (*Fratercula cirrhata*), Western, Glaucous-winged and hybrid gulls; Pigeon Guillemot, Brown Pelican (*Pelecanus occidentalis*), Common Loon (*Gavia immer*), and Black Oystercatcher (*Haematopus bachmani*). No Marbled Murrelets (*Brachyramphus marmoratus*) were observed prior to launch or during UAS flight. Marine mammals showed similar responses. A raft of 75 sea otters (*Enhydra lutris*) showed no signs of disturbance from the Puma flown as low as 350 feet AGL. Marine mammals observed during test flights include sea otter, Steller's sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*) and harbor seal (*Phoca vitulina*). These results are in agreement with those from test flights in the Channel Islands National Marine Sanctuary and National Park (CA) in 2012.

Due to bandwidth limitations in the downlink, video and still frame shots from the Puma were compressed down from the original resolution. Furthermore, additional image quality was lost while converting to a format suitable for post-processing. As a result, the image quality was so low that it was

impossible to count birds on a colony using still frame or video footage from the Puma.

### COLONIES—OREGON

**Shawn W. Stephensen** and **David B. Ledig** of the Oregon Coast National Wildlife Refuge Complex (OCNWRC) conducted an aerial seabird colony survey that included the entire OR coast on 3–4 June 2013. The aircraft used was a Bell Jet Ranger III helicopter operated by **Mike Nehring** of Northwest Helicopters (Olympia, WA). Total flight time was approximately 10 hours. All Common Murre, Brandt's, Pelagic, and Double-Crested Cormorant colonies were photographed using digital cameras, and birds were counted on the images utilizing geographic information system (GIS) computer software. Thousands of digital images were organized and archived for future reference. Colony attendance by murres was slightly depressed compared to previous years; however, they returned to nest at several historical colony sites that had not been attended in the last ten years.

**Tim Halloran** (USFWS volunteer) and **Shawn W. Stephensen** conducted a status assessment of the Tufted Puffin population at Haystack Rock, which is in the Oregon Islands National Wildlife Refuge. The project also included a pilot study to evaluate the feasibility of monitoring additional reproductive parameters at the island, such as breeding phenology, from shore-based vantage points. The number of Tufted Puffins present at Haystack Rock was documented in 4 consecutive years (2010–2013) by conducting instantaneous counts of birds on the land, water, and in the air at 15-minute intervals. The daily mean counts were 42, 33, and 13 birds during 2010, 2011, and 2012 respectively. Burrow occupancy was determined and the annual breeding population estimate was calculated based on the number of viable occupied burrows. We estimated the Tufted Puffin breeding population (individual birds) at Haystack Rock to be 127 in 2010, 97 in 2011, and 74 in 2012. We have not completed 2013 data

analysis; however, the initial data review indicates 80 to 90 puffins appeared to have nested. We also documented many negative interactions with gulls and disturbances by eagles, as well as interesting social behaviors between puffins.

In response to documented mammalian predation on some near-shore island seabird colonies along the southern OR coast, **David Ledig** and **Bill Bridgeland** (OCNWRC) have been monitoring predator activity and seabird response for several years. In 2012, the existing monitoring program was intensified on selected colonies based on their vulnerability to visitation by mainland meso-carnivores (i.e., proximity to the mainland), and their known history of predator presence and activity. Our objectives were to document predator species, timing of activity, and seabird response, to inform management response to predator damage. Our strategy included regular field surveys to document changes in surface-nesting seabird colony configurations (which might indicate disturbance); predator sign on the adjacent mainland intertidal areas; and inspections on each island, when these could be done without disturbing the nesting birds. In addition, we installed 16 trail cameras on five islands to photograph seabirds or predator access trails. Cameras at colonies were equipped with external batteries and set to take photos every minute for either 12 hours (dusk to dawn), or 24 hours per day, for the majority of the breeding season. The cameras were not accessible for us to download photos until the birds had completed nesting. Other cameras directed at predator access trails were programmed for motion-detection photography, and memory cards and batteries were retrieved periodically throughout the breeding season.

Results to date include photographs that document raccoon (*Procyon lotor*), river otter (*Lontra canadensis*), and mink (*Neovison vison*), or some combination of those species, on three of the five islands we monitored. On one island where raccoon predation appeared to result in abandonment of a Common Murre and Brandt's Cormorant colony



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in 2012, both seabird species returned in greater numbers in 2013, and they successfully fledged young this year. Raccoons and mink were still documented on the island but did not cause significant disturbance to the birds. On two other islands that had nesting Leach's Storm-Petrels (*Oceanodroma leucorhoa*), raccoons and river otters preyed upon adult birds and nests, but it is unclear whether there was a significant impact on the colonies. Analyses of the hundreds of thousands of photographs produced by the cameras are not complete, but it is clear that cameras can provide considerable insight into the source, chronology, and intensity of predator disturbance to nesting seabirds. We intend to continue camera surveillance and timely predator control on these colonies next year.

A new study to develop non-invasive methods to monitor burrow-nesting seabirds will evaluate acoustic recorders and remote cameras, and will compare new indices for determining burrow occupancy. Collaborators include **Dan Roby** (Oregon State University [OSU] and US Geological Survey–Oregon Cooperative Fish and Wildlife Research Unit [OCFWRU]); **Rob Suryan** (OSU, Hatfield Marine Science Station); and **Roberta Swift** (USFWS, Migratory Bird and Habitat Programs [MBHP]). Funding will come through the USGS–USFWS Science Support Partnership. This project will commence in 2014 with support from **Roy Lowe**, **Shawn Stephensen**, and **Bill Bridgeland** (OCNWRC).

**Rob Suryan**, **Amanda Gladics**, **Cheryl Horton**, **Amelia O'Connor**, **Jessica Porquez**, (OSU), and **Stephanie Loreda** (Environment for the Americas intern) conducted studies of Common Murres at the Yaquina Head colony in Newport, OR. This is the seventh consecutive year of collaborative studies at this site among OSU, Bureau of Land Management, and USFWS. Reproductive success for murres (fledglings per eggs laid) was low again in 2013 (24%), as in 2012 (27%). Reproductive success for the last three years (2011–2013) has been greatly reduced compared to the previous four years (2007–2010; 22–27% and

54–77% respectively). Hatching phenology in 2013 was slightly later than 2012 (the 2013 median hatch date was 4 July), but not as late as in previous years. While murres may have experienced suboptimal foraging conditions at times during 2013, the greatest reproductive loss this year can be attributed to increased disturbance by Bald Eagles (*Haliaeetus leucocephalus*). Initial disturbance by eagles (i.e., during murre incubation) was moderate in 2013. However, eagle disturbance increased through murre chick-rearing. Furthermore, it concentrated on a previously unaffected area of the colony, likely contributing to the total failure of nests in those plots. Unlike 2012, when Brown Pelicans (*Pelecanus occidentalis*) caused 39% of all disturbances, pelicans were not an important cause of disturbances in 2013.

Rob Suryan's additional research on Short-tailed Albatrosses (*Phoebastria albatrus*) Asia is described in that regional report.

### BROWN PELICANS

In several past years, a few pelicans on East Sand Island have been observed practicing breeding behavior (courtship, nest construction, and nest attendance) on East Sand Island. This year, in early July, three pairs of pelicans were observed to be fastidiously attending nests in beach grass adjacent to the Caspian Tern colony. It was later confirmed that these nests contained eggs. This is believed to be the northernmost documentation of breeding (egg-laying) by California Brown Pelicans. Unfortunately, all nests were abandoned by the end of July, prior to any eggs hatching. (Observers of pelicans at East Sand Island were those listed in the following section.)

USFWS biologists **Shawn W. Stephensen** and **Michael J. Szumski** conducted a coastal aerial survey of California Brown Pelicans on 12–13 September 2013. The 2013 survey area was from Mack Arch, OR, to Cape Elizabeth, WA. The proposed survey extent was from Smith River, Del Norte County, northern CA, to Tunnel Island, Grays Harbor County, central WA. However, due to fog and poor visibility, Mack Arch south to

Smith River could not be surveyed. Cape Elizabeth north to Tunnel Island was not surveyed because of insufficient daylight. We included all bays, rocks, reefs, islands, coastal beaches, and waters up to 0.5 mile (0.8 km) offshore that were not shrouded in fog. The aircraft used was a fixed-wing Cessna 185, operated by USFWS pilot **Charles (Corky) W. Roberts** (Office of Law Enforcement, Burbank, WA). Survey flight altitude ranged from 60 to 245 m AGL, and aircraft speed ranged from 145 to 210 km/h. A GPS recorded the flight track of the aircraft throughout the entire survey. A total of 7,018 individual pelicans was counted in 2013; counts conducted between 2001 and 2012 resulted in a range of 6,664 to 18,769 (Figure 1). **Deborah Jaques** (Pacific Eco Logic) and volunteer boat operator **Curt Clumpner** conducted a boat-based pelican survey of East Sand Island, Columbia River estuary, on the same day as the USFWS aerial survey. Jaques estimated a total of 2455 pelicans; USFWS estimated 2360. East Sand Island continues to be the site of the largest congregation of pelicans during summer on the OR coast.

### TERNS, CORMORANTS, AND FISH ON THE COLUMBIA RIVER

Researchers from OSU, ORCFWRU, Real Time Research, Inc. (RTR), and other cooperators continued studying interactions between seabirds and forage fish in the Pacific Northwest in 2013. This year, research was conducted on East Sand Island in the Columbia River estuary, where large breeding colonies of Caspian Terns (*Hydroprogne caspia*) and Double-crested Cormorants reside, and also on colonies of Caspian Terns, Double-crested Cormorants, American White Pelicans (*Pelecanus erythrorhynchos*), and several gull species (*Larus* spp.) located throughout the region. Investigations into the effects of avian predation on survival of juvenile salmonids (*Oncorhynchus* spp.) in the Columbia River basin were a continuing emphasis of this research.

In 2013, the U.S. Army Corps of Engineers (USACE) maintained 0.6



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hectares (1.5 acres) of suitable Caspian Tern nesting habitat on East Sand Island, approximately the same area that was available in 2012. Peak colony size was preliminarily estimated at approximately 7,400 pairs, up from the 2012 estimate of 6,400 pairs. In addition to an apparent increase in the colony population, terns were more resilient to disturbance by Bald Eagles and depredation of eggs and chicks by Glaucous-winged and Western Gulls. Productivity estimates are pending. However, it is apparent that productivity was greater than seen during 2010–2012, although it did not approach levels seen in the early 2000s. Amazingly, adult terns were fledging chicks into the first week of October 2013.

Studies were initiated in 2011 to test strategies for limiting the extent of the Double-crested Cormorant colony on East Sand Island; this work continued in 2013. Privacy fencing was used to define an area for cormorant nesting, with human hazing to prevent cormorants nesting outside that area. In 2013, the amount of area available to cormorants was reduced from 4.5 ha (11 ac) in 2012 to 1.5 ha (3.8 ac), and the location of the cormorant site was moved adjacent to the 2012 nesting area. The 1.5 hectares of habitat made available to cormorants in 2013 was modestly larger than the area they had actually used in recent years (1.0–1.2 ha during 2005–2012 [2.5–3.1 ac]). Despite the shift in nesting location and reduction in available habitat, the peak size of the Double-crested Cormorant colony on East Sand Island was tentatively estimated to be ca. 15,000 breeding pairs, the largest estimate of colony size ever recorded at this site. Productivity estimates are also pending for cormorants, but preliminary analyses suggest chick survival was within the historical range for this colony. Brandt's Cormorants continued to nest amongst Double-crested Cormorants at East Sand Island; our preliminary estimate of the peak colony size for Brandt's Cormorant is over 1,000 pairs, similar to 2011–2012.

In 2013, we examined the foraging ecology of Caspian Terns nesting at Goose Island, in Potholes Reservoir

(eastern WA) using remotely downloadable Global Positioning System (GPS) transmitters. Previously we knew that individuals from this colony sometimes travel to the middle Columbia River (> 30 km away), where they consume juvenile salmonids during the fishes' migration to the ocean, based on recovery of salmonid tags at the colony. GPS-tracking results in 2013 indicated that at least two-thirds of the tagged terns traveled to the Columbia River or its major tributary, the Snake River. This finding documents the largest foraging range ever observed in breeding Caspian Terns ( $\geq 93$  km).

Ongoing implementation of the Caspian Tern Management Plan continued in 2013. USACE has recently constructed six islands to attract Caspian Terns away from the Columbia Basin. Five of these sites were used by breeding Caspian Terns in 2013, including islands in Sheepy Lake, Lower Klamath NWR (CA); Tule Lake, Tule Lake NWR (CA); Crump Lake in the Warner Valley (OR); East Link Impoundment in Summer Lake Wildlife Area (OR); and Malheur Lake, Malheur NWR (OR). (One island at Summer Lake was not used in 2013.)

A total of over 1,100 breeding pairs of Caspian Terns nested at these restoration sites in 2013, an increase of 50% over 2012, the previous most active year. Pro-

ductivity continued to be low and variable among these five sites, however, ranging from 0 to 0.37 fledglings/breeding pair.

The Draft Environmental Impact Statement (DEIS) on "Double-crested Cormorant Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary" was released for public review June 19, 2014. The DEIS was written by USACE and co-operating agencies (WDFW, ODFW, USFWS, US Department of Agriculture-Wildlife Services). The comment period closes August 4. More information can be found on the project website: <http://www.nwp.usace.army.mil/Missions/Currentprojects/CormorantEIS.aspx>.

### PELAGIC STUDIES

At the mouth of the Columbia River, **Don Lyons** (OSU) and **Dan Roby** (OCFWRU) initiated a pilot study to investigate the use of diving waterbirds to collect physical oceanographic data. **Adam Peck-Richardson** (OSU) led the fieldwork, which involved tagging Brandt's Cormorants with GPS tags having integrated depth and pressure sensors. Preliminary depth estimates for geolocated bottom dives by cormorants correlated well with high-resolution bathymetry data derived from sonar. This suggests that diving waterbirds may be able to collect bathymetry data in areas

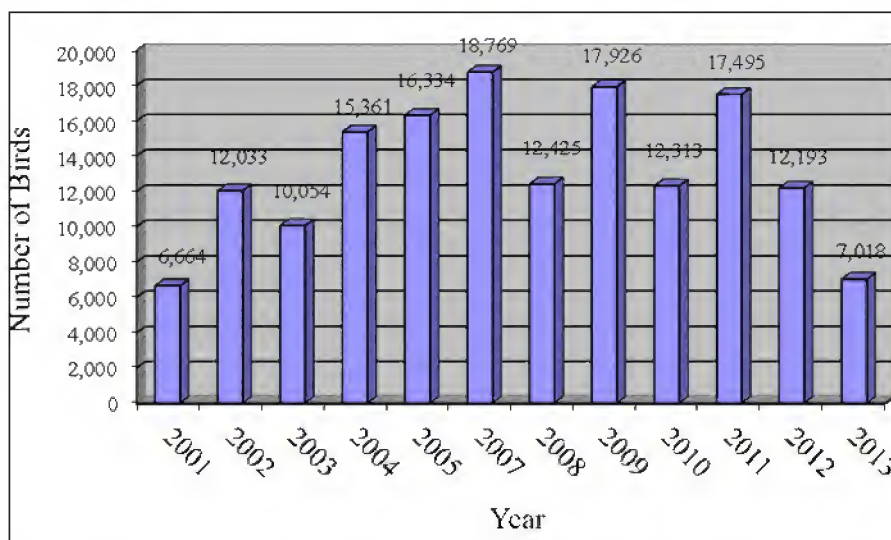


FIGURE 1. Number of California brown pelicans counted during 2001 to 2013 on the Oregon and Washington coast.

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that are difficult to access, or under hydrologic conditions where traditional sampling equipment is difficult to operate safely or successfully. **Jim Lerczak** (OSU's College of Earth, Ocean, and Atmospheric Sciences) was an important collaborator on the project, which was funded by the Office of Naval Research.

**Rob Suryan, Jessica Porquez, Amelia O'Connor, and Amanda Gladics** (OSU) began regular vessel-based surveys of the marine bird community along the Newport Hydrographic line and at a proposed marine energy-testing facility off Newport.

**Elizabeth Phillips** is a PhD student in the Fisheries Acoustics Research lab at the School of Aquatic and Fishery Sciences, University of Washington (UW). She is examining the influence of river plumes on seabird-forage fish interactions, with a focus on the two dominant seabirds in the northern California Current System: Sooty Shearwater (*Puffinus griseus*) and Common Murre. She is working in collaboration with **Jen Zamon** (NOAA–National Marine Fisheries Service [NMFS]) and others at NWFSC and the Southwest Fisheries Science Center, and **Josh Adams** (USGS).

The Marbled Murrelet Effectiveness Monitoring Program (MMEMP) aims to assess the status and trends of Marbled Murrelet populations and nesting habitat, from the Canada–WA border to central CA. The program has used boat-based transects in the coastal waters of this area to monitor murrelets since 2000; other seabird species are also recorded. The goal is to estimate Marbled Murrelet populations and trends, and to evaluate the effectiveness of the Northwest Forest Plan in conserving murrelets. Recent efforts include development of statistical models to investigate the relative influences of amount and distribution of nesting habitat (older coniferous forest up to 80 km inland) and ocean indicators of foraging habitat on the status and trend of murrelet populations. MMEMP surveys in WA were led by **Scott Pearson** and **Monique Lance** (WDFW) in Puget Sound, Strait of Juan de Fuca, and the WA coast. Surveys in OR and CA were led

by **Craig Strong** (Crescent Coastal Research). Other contributors to the monitoring program included **Marty Raphael** and **Tom Bloxton** (U.S. Forest Service [USFS]–Pacific Northwest Research Station [PNW], Olympia, WA), **Sherri Miller, C.J. Ralph** and **Jim Baldwin** (USFS–Pacific Southwest Research Station, Berkeley, CA), **Kim Nelson** (OSU), **Andrew Shirk** (PNW), **Deanna Lynch** (USFWS, Lacey, WA), and **Rich Young** (USFWS, Portland, OR). Many seasonal technicians made the population surveys possible. **Gary Falxa** (USFWS, Arcata, CA) coordinates the program. Preliminary results were recently presented at the workshop, “Predators and California Current Preyscape”, hosted by Point Blue Conservation Science. Reports with results of habitat and population monitoring are available at: <http://www.reo.gov/monitoring/mm-overview.shtml>.

### SEABIRD-FISHERIES INTERACTIONS

**Ed Melvin** and **Troy Guy**, Washington Sea Grant, and **Rob Suryan** and **Amanda Gladics**, OSU, continue to promote seabird conservation through research and outreach in CA, OR and WA groundfish fisheries with funding from NWFSC, National Fish and Wildlife Foundation, and the Packard Foundation. They recruited vessels to host research that aims to adapt streamer lines, developed and proven effective in fisheries of Alaska (AK), to suit the longline vessels and varied fishing gear of West Coast fisheries. With additional help from **Joe Tyburczy**, California Sea Grant, they distributed seabird identification and life history information, and bycatch mitigation outreach materials in major fishing ports from Northern California to WA. This was in response to the recent USFWS Biological Opinion for West Coast groundfish fisheries that establishes an incidental take limit of two Short-tailed Albatrosses over two years across West Coast groundfish fisheries (trawl, pot, and longline). The opinion also calls for the mandatory use of streamer lines on longline vessels over 55 ft (16.8 m) long, starting in 2014, and recommends

that smaller vessels use streamer lines voluntarily. To jumpstart West Coast bycatch avoidance and promote voluntary use of seabird bycatch mitigation measures on smaller vessels, the team continues to work with NMFS to provide streamer lines to the tribal and non-tribal West Coast fleet at no charge. Over 250 streamers have been distributed from Northern CA through WA since 2009.

**Ed Melvin** participated in the May 2012 meeting of the Agreement on the Conservation of Albatrosses and Petrels, Seabird Bycatch Working Group, held in La Rochelle, France. He chaired the pelagic longline and gillnet mitigation sessions of the working group. He plans to work with BirdLife International and other collaborators to provide training on seabird bycatch avoidance to the Asian longline fleets in Taiwan and Korea in the fall of 2013, and he continues to collaborate with Japanese scientists on seabird bycatch mitigation research in the North Pacific.

In December 2011, a Geographic Information Systems (GIS) mapping project was initiated to examine whether there was a correlation between the declining Marbled Murrelet population trends and increasing gillnet fishery landings in Puget Sound, WA. The first component of the GIS mapping project overlaid Marbled Murrelet population densities with fisheries catch effort by marine catch areas for commercial fisheries of WA. Goals were to (1) examine seasonal variations in foraging and fishing trends, and (2) identify areas of concern where increased fisheries and high murrelet densities coincided for 2001–2010. Overall results demonstrated that in areas of high Marbled Murrelet densities, lower fishing effort occurred; conversely, in areas of low Marbled Murrelet densities, higher fishing effort occurred. Efforts are currently underway to overlay and map treaty-tribal fishing effort with Marbled Murrelet densities, to see whether tribal fishing effort is demonstrating the same trends. Cooperators include **Gary Falxa** and **Martin Raphael**, **Deanna Lynch** and **Nancy Brennan-Dubbs** (USFWS), **William Beattie** (Northwest Indian



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Fisheries Commission), **Kyle Adicks** and **Kendall Henry** (WDFW), and **Amilee Wilson** and **Barbara Seekins** (NMFS). This work is funded by NOAA. Its completion is expected by 2015.

### CONSERVATION—OTHER

**Rob Suryan** and collaborators at OSU and UW completed the first year of a project to design, test, and deploy an integrated sensor array that will continuously monitor interactions (including impacts) of avian and bat species with offshore wind turbines. They are developing a synchronized array of sensors, including accelerometers, contact microphones, visual and infrared spectrum cameras, and bioacoustic monitors. Custom-designed post-processing of data and statistical-based software will detect impacts from other disturbances and trigger event recording.

Undergraduate research students in **Peter Hodum**'s lab at UPS, in collaboration with Oikonos, quantified the frequency of occurrence and types of marine plastic debris present in the stomachs of forage fish species caught by Rhinoceros Auklets during summer of 2013. This work was part of a larger program to document plastic ingestion patterns in Pacific seabirds.

The Puget Sound Partnership (PSP) is a state agency in WA that coordinates regional efforts to improve the health of Puget Sound. PSP has adopted population abundance, breeding success, and diet of three species of marine birds, Rhinoceros Auklet, Pigeon Guillemot, and Marbled Murrelet as indicators of biophysical conditions in Puget Sound. **Scott Pearson** (WDFW) and **Nathalie Hamel** (PSP), in collaboration with WDFW, USFS, and other organizations, will be compiling and analyzing the data for the Partnership. The report is available from: [nathalie.hamel@psp.wa.gov](mailto:nathalie.hamel@psp.wa.gov).

**Jessi Hallman Behnke** (Pacific Rim Conservation, Honolulu, HI) is in the final stages of writing up the results of her master's research in collabora-

tion with **Marjorie Brooks** (Southern Illinois University Carbondale) and **Eric Anderson** (Simon Fraser University). She is investigating inorganic contaminants in Surf Scoters (*Melanitta perspicillata*) and White-winged Scoters (*M. fusca*) in the Puget Sound–Georgia Basin and in Southeast Alaska.

### OTHER STUDIES AND NEWS

**Michelle Kappes** is an instructor and researcher in the Department of Fisheries and Wildlife at OSU, where she has been teaching classes online and on-campus, and is continuing research on albatrosses in collaboration with **Robert Suryan** at OSU and **Gabrielle Nevitt** at the University of California Davis.

Undergraduate research students in **Peter Hodum**'s lab at UPS, in collaboration with Oikonos, are analyzing stable isotopes to characterize historical and contemporary diets of Tufted Puffins, using museum specimens from the Slater Museum of Natural History and the Burke Museum of Natural History and Culture (University of Washington).

**Julia Parrish**, **Jane Dolliver**, **Liz Mack** and **Charlie Wright** (UW) continued to monitor seabird mortality indices through the Coastal Observation and Seabird Survey Team (COASST) citizen science network. Now in its fifteenth year, the program collects beached bird survey data across 495 sites (Eureka, CA to Kotzebue, AK). From October 2012 to September 2013 COASST recorded 3549 carcasses of 100 species and added 78 participants (800 current surveyors).

**Peter Kappes** is working on a PhD with **Katie Dugger** at OSU, investigating the reproductive ecology and population dynamics of Adélie Penguins (*Pygoscelis adeliae*). He will be departing to Ross Island, Antarctica in November 2013 for his second field season.

**Lora Leschner** is the Washington coordinator for the Pacific Coast Joint Venture. People can check the website for monthly bird news and grant information for HI, AK, northern CA, and

the western portions of OR, WA, and British Columbia ([www.pcjv.org](http://www.pcjv.org)). Lora is also on the advisory board of the Olympic Coast National Marine Sanctuary.

Staff of FWS-MBHP (Portland, OR) participated in meetings concerned with two proposed renewable energy projects in OR: an offshore wave energy development near Newport, and a wind power project off Coos Bay. MBHP staff provided technical assistance regarding potential impacts to migratory birds, particularly seabirds.

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## NORTHERN CALIFORNIA

Compiled by **Jessie Beck** and  
**Hannah Nevins**

### COLONY MONITORING

With a grant from the National Fish and Wildlife Foundation (NFWF) Pacific Seabird Program, Audubon facilitated the second year of survey work for Ashy Storm-petrels (*Oceanodroma homochroa*) at Point Reyes National Seashore. Results suggest that Point Reyes, especially Bird Rock, is an important small colony area for this rare and declining species. The field work was conducted by **Harry Carter** and his team from California Institute of Environmental Studies, and **Ben Becker** at Point Reyes National Seashore.

**Ron LeValley** of Mad River Biologists, in conjunction with the Sea Ranch California Coastal National Monument (CCNM) Stewardship Taskforce, Mendocino Coast Audubon Society and other groups, has continued monitoring Pelagic Cormorant (*Phalacrocorax pelagicus*) colonies in the Mendocino County region of northern California (CA) for the 5th year. Citizen scientists have volunteered to monitor known colonies. More volunteers and sites have been added to the project, and more than 15 sites with 5 to 25 nests each are now being monitored for reproductive success. The 2013 season was highly



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productive compared to the past three years. Ron is collaborating with others up and down the Pacific Coast to compile a broad assessment of Pelagic Cormorant reproductive success over multiple years.

The Sea Ranch CCNM Stewardship Taskforce continued to support weekly breeding surveys of seabirds, nests, and young at Galleon's Reach, near Sea Ranch—Arched Rock, Black Point and Gualala Point Island (Sonoma County). Five aerial flights over the colony supplemented photographs by the U.S. Fish and Wildlife Service (USFWS) and National Oceanographic and Atmospheric Administration (NOAA) of seabird colonies on Gualala Point Island and Fish Rocks (Mendocino County). Data from Gualala Point Island were reviewed for population trends among breeding seabirds and correlations of population changes with ocean conditions. This work was funded by the Bureau of Land Management (BLM), Madrone Audubon Society, and the Sea Ranch CCNM Stewardship Taskforce. The following report will be posted on the BLM CCNM website: M. García-Reyes, J.A. Thayer, and W.J. Sydeman, 2013. Citizen science studies of Gualala Point Island: Seabird populations and productivity, 2007-2012: Historical, Regional and Environmental Comparisons. Unpublished report. 28 pp.

**Ron LeValley** has also worked with **Anna Weinstein** of California Audubon, **Joleen Osello** of the Mendocino Coast Audubon Society, the Sea Ranch CCNM Stewardship Taskforce, and Audubon Chapter citizen scientists to monitor the reproductive success of Black Oystercatchers (*Haematopus bachmani*) in coastal Mendocino for the third year. Sites included rocks and islands in the California Coast National Monument and islands off the Sea Ranch coastline. Eighty-five to 100 nests were monitored through fledging or nest failure in 2012 and 2013. Reproductive success has been variable both from year to year and from site to site. Researchers will continue this effort to establish baseline data for future analysis, including the mapping of oystercatcher nests and territories across suitable habitat in the state.

In 2013, the CCNM Taskforce monitored Black Oystercatchers on the Monterey Peninsula. This project is a partnership with Environment for the Americas and covers the most extensively visited portion of the CCNM. The report will be posted to BLM's CCNM website: H.J. Ceja, S. Aroche, and H.E. Hanks, 2013. Black Oystercatcher (*Haematopus bachmani*) reproductive success, Point Pinos to Asilomar, Monterey Peninsula, CA. Unpublished manuscript. 19 pp.

2013 marked the 21st consecutive year of seabird monitoring at Año Nuevo Island and the adjacent mainland. **Michelle Hester**, **Ryan Carle**, **Jessie Beck**, and **David Calleri** (Oikonos Ecosystem Knowledge) monitored the populations and productivity of all breeding species, plus diet of Rhinoceros Auklets (*Cerorhinca monocerata*). Productivity was above average for Rhinoceros Auklets, Cassin's Auklets (*Ptychoramphus aleuticus*), Western Gulls (*Larus occidentalis*), and Brandt's Cormorants (*Phalacrocorax penicillatus*), probably driven by an abundance of quality prey. Juvenile rockfish (*Sebastes* spp.) and anchovy (*Engraulis mordax*) together made up 95% of Rhinoceros Auklet chick diet. The Rhinoceros Auklet population remained stable, while the Cassin's Auklet population grew to over 100 breeding individuals for the first time. Pelagic Cormorant productivity was the greatest on record for the island (ca. 2.3 chicks per pair), but was very poor on the mainland (ca. 0.25 chicks per pair), due to Common Raven (*Corvus corax*) predation of eggs. Plant restoration efforts for burrow-nesting Rhinoceros and Cassin's auklets continued to be successful, with record numbers of both species breeding in natural burrows in the restoration area in 2013.

**Russ Bradley**, **Pete Warzybok**, **Ryan Berger** (Point Blue Conservation Science) and collaborator **Gerry McChesney** (USFWS) monitored population size, reproductive success, and diet for 13 species of breeding seabirds on Southeast Farallon Island (SEFI). Species included gulls (*Larus* spp.), storm-petrels (*Oceanodroma* spp.), cormorants (*Phalacrocorax* spp.), Com-

mon Murres (*Uria aalge*), Cassin's Auklets, Black Oystercatcher, Tufted Puffin (*Fratercula cirrhata*), and Pigeon Guillemot (*Cepphus columba*).

2013 was a high-productivity year for all species breeding on the Farallones. There was strong upwelling throughout the spring and summer, leading to high ocean productivity and an abundance of krill (euphausiids) around the islands. The krill-feeding Cassin's Auklets exhibited high productivity for the fourth consecutive year and had a high rate of double brooding. Very high abundance of juvenile rockfish in the chick diet led to above-average breeding success for Common Murres, Rhinoceros Auklets, and Pigeon Guillemots. In addition, Brandt's and Pelagic Cormorants and Western Gulls all experienced high breeding success in 2013, after several years of complete or near-complete breeding failure. For Brandt's Cormorant it was the highest productivity observed since 1999. California Gulls (*L. californicus*) successfully fledged a handful of chicks for the first time since they began breeding on SEFI in 2008. Among the non-seabird species, neither the Peregrine Falcons (*Falco peregrinus*) nor the Common Ravens that bred on the island in recent years were successful this season. Canada Geese (*Branta canadensis*) nested on the Farallones for the fourth consecutive year but failed to produce any young. The Northern Gannet (*Morus bassanus*) that arrived on the island in the spring of 2012 has remained and is observed roosting on the island on a daily basis. Several Blue-footed Boobies (*Sula nebouxi*) were also observed at the Farallones during fall 2012.

The Common Murre Restoration Project concluded its 18th season of seabird productivity and disturbance monitoring. Co-Principal Investigators on the project are **Gerry McChesney** (USFWS) and **Rick Golightly** (Humboldt State University [HSU]); **Alison Fuller** (HSU) coordinated field activities. Field biologists in 2013 included **Crystal Bechaver**, **Katie Percy**, **Jason Tappa**, **Katrina Olthof**, **Johanna Anderson**, and **Lacey**

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**Hughey.** The project is funded by the *Luckenbach Oil Spill Trustee Council*.

Four colony complexes were monitored by six seasonal field biologists in 2013, including Point Reyes Headlands (Marin County, CA), Drakes Bay Colony Complex (Marin County, CA), Devil's Slide Rock and Mainland (Pacifica, CA), and Castle-Hurricane Colony Complex (Big Sur, CA). The breeding season commenced earlier than average. Murre numbers continued to increase at Devil's Slide Rock, which was recolonized using social attraction from 1996 to 2005. Preliminary Common Murre productivity estimates on breeding plots at Devil's Slide Rock and Castle-Hurricane were the highest on record—0.95 and 0.81 chicks fledged per pair, respectively. The preliminary productivity estimate on breeding plots at Point Reyes (0.43 chicks fledged per pair) was slightly below average, but higher than 2012's dismal productivity, during which juvenile Brown Pelicans (*Pelecanus occidentalis*) disturbed the Murre colony to the point of near-complete breeding failure. Brandt's Cormorant productivity estimates were also above average at all colony complexes, with some of the highest numbers since at least 2007. Aircraft and boat disturbance was relatively low in 2013.

Additionally, the effectiveness of newly established marine protected areas is being monitored via the Baseline Seabird Monitoring Studies in the California North Central Coast Study Region. Reports are being finalized in collaboration with **Dan Robinette** of Point Blue Conservation Science, **Harry Carter** of Carter Biological Consulting, and others. In 2013, reports summarizing population trends of Brandt's Cormorants in south-central CA and the Monterey Bay area were finalized, in collaboration with **Phil Capitolo** of University of California Santa Cruz (UCSC) and others.

### THREATENED AND ENDANGERED SPECIES

**Susan Euing** (USFWS), **Meredith Elliott** (Point Blue Conservation Science), and **Julia Fiske** (USFWS

intern) monitored the California Least Tern (*Sternula antillarum browni*) colony at Alameda Point, a former Naval Air Station in Alameda, Alameda County, CA. Despite a disastrous year in 2012, in which the colony had been heavily preyed upon by Peregrine Falcons and American Kestrels (*Falco sparverius*), the Least Terns returned to make 2013 a very successful reproductive year. The estimated number of breeding pairs was 276; the number of nests was 292. Of 556 eggs laid, 472 (85%) hatched; an estimated 306 fledglings survived to migrate, compared to only 17 in 2012. Breeding success was 1.11 fledglings per breeding pair. Predation decreased by 87%, from 372 incidents in 2012 to 47 in 2013. Approximately 12% of eggs were either abandoned or failed to hatch. Fifty-six eggs were recovered for analysis.

**Bill Henry** and **Breck Tyler** (University of California Institute of Marine Science) report that results from the 2013 Central Coast Marbled Murrelet [*Brachyramphus marmoratus*] Monitoring (Region 6) were upbeat, a welcome change for this imperiled population.

The Humboldt Redwood Company, LLC (HRC) continued its conservation activities for the Marbled Murrelet under the company's Habitat Conservation Plan (HCP). Project leaders were **Sal Chinnici** and **Mark Freitas** of HRC. The HCP requires tracking of murrelet occupancy and numbers over time, using both audiovisual (AV) and radar techniques. Surveys were continued in 2013 at the Headwaters Forest Reserve and Humboldt Redwoods State Park (Reserves), and also at the Marbled Murrelet Conservation Areas (MMCAs) on HRC forest lands. Collaborators were Mad River Biologists, O'Brien Biological Consulting, and **Adam Brown**.

Since the inception of HCP monitoring (1999), AV surveys have detected "occupied" behaviors (below-canopy flight or circling) in the MMCAs and Reserve stands. In 2013, surveyors conducted 136 surveys at 33 stations and

observed "occupied" behaviors in all monitored Reserves and all MMCAs, with the exception of the Shaw Creek MMCA.

Radar surveys track murrelets traveling to and from nesting areas within the MMCAs and Reserves. Radar counts are considered indices of the breeding population. In 2013, 56 radar surveys were conducted at 14 sites. Most murrelets tracked by radar were at Humboldt Redwoods State Park and the Allen Creek MMCA. Although AV surveys did not detect murrelets at Shaw Creek, radar surveys detected murrelets at this stand. Final analyses of the 2013 data have not yet been conducted. The 2012 data indicated that, after ten years of monitoring (since the 2002 baseline), there has been an increase in radar counts in the MMCAs but not in the Reserves.

### FORAGING ECOLOGY, PELAGIC STUDIES

**Scott Shaffer** (UCSC) and his students are doing research in many parts of the Pacific. **Melinda Connors**, his doctoral student (and a Nancy Foster fellow), has completed field work for her dissertation at Tern Island, Northwest Hawaiian Islands. **Shaffer**, and **Sarah Gutowsky** from Dalhousie University in Nova Scotia, Canada, are continuing to study foraging ecology Albatrosses from Midway Atoll. These projects are described further in the Hawai'i regional report.

**Shaffer's** student **Rachael Orben** has completed field work for her doctoral thesis at UCSC. Her study is part of a large project funded by North Pacific Research Board (NPRB) that is spearheaded by **Dave Irons** (USFWS) and **Dan Roby** (USGS); see the Alaska regional report. **Corey Clatterbuck** and **Anne Cassell**, Master's students of Shaffer's at San Jose State University (SJSU), are examining incubation behavior and diets of Western Gulls at Año Nuevo Island. Master's student **Emma Kelsey** is studying incubation routines of Cassin's Auklets at SEFI, in collaboration with **Russell Bradley**, **Pete**



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**Warzybok**, and **Jaime Jancke** of Point Blue Conservation Science.

**Shaffer's** new graduate students include **Caitlin Kroeger**, who originally started at SJSU with him. The two are collaborating with **David Thompson** and **Paul Sagar** of the National Institute of Water and Atmospheric Research in New Zealand. Kroeger is starting doctoral research on the foraging ecology and energetics of two albatross species at Campbell Island in New Zealand. **Morgan Gilmour** has completed a Master's degree at Bucknell University with **Don Dearborn** and is also starting a doctoral degree with Shaffer.

**Ryan Carle** (Oikonos Ecosystem Knowledge) is finishing an MS project on Rhinoceros Auklet diet and reproduction at Año Nuevo Island, CA. He is using stable isotopes to investigate carry-over effects of spring and winter diet on breeding parameters, sex-specific and age-specific diet differences, and seasonal trophic shifts in this species. He is working under **Jim Harvey** at Moss Landing Marine Laboratories (MLML) and with **Michelle Hester**, **Jessie Beck**, and **David Calleri** of Oikonos.

**Josh Adams**, United States Geological Survey (USGS), and **Bill Henry** (MLML) recently launched the California Current Ecosystem Seabird Telemetry Atlas. This project compiles seabird tracking data into a common format and serves to guide ocean planners and managers to primary data holders.

**Josh Adams** and **Jonathan Felis** (USGS) are working with Oikonos (**P. Hodum**) and collaborators (**D. Hyrenbach**, Hawai'i Pacific University, and **E. Phillips**, University of Washington) to evaluate seabird utilization of marine areas off the Pacific Coast (CA, OR, and WA). They have been focusing on the Pink-footed Shearwater (*Puffinus creatopus*) since 2006, and added Common Murres in 2012–2013. With support from the Bureau of Ocean Energy Management (BOEM), data from satellite telemetry will be combined with vessel-based transect surveys to better inform alternative energy planning at sea within the greater California

Current region. They anticipate data analyses by **D. Ainley** and **L. Spear** (HT Harvey and Associates), including a species-specific evaluation of seabird vulnerability to energy infrastructure, based on ranging behaviors, area use, and new information on heights of seabird flight.

### CONSERVATION, RESTORATION, AND OIL SPILL PREPAREDNESS

Audubon and partners in the California Forage Coalition (Audubon, Oceana, Ocean Conservancy, Natural Resources Defense Council, Pew Trusts) supported the development of a State Forage Policy for CA. This historic policy prevents the development of new commercial fisheries on currently unfished species (such as smelts [Osmeridae] and sand lance), or the expansion of existing fisheries, without first accounting for the needs of seabirds and other marine predators. The policy can be found at: <http://www.fgc.ca.gov/policy/p2fish.aspx> - FORAGE

A workshop on conservation of marine forage species, "Towards ecosystem-based fishery management in the California Current System—Predators and the preyscape," was held on 9–13 September at Point Blue Conservation Science in Petaluma, CA. Included among the predators were seabirds, pinipeds, and cetaceans; prey included anchovies (*Engraulis* spp), sardines (*Sardinops* spp), juvenile rockfish, juvenile salmon (Salmonidae), squid, and smelts (Osmeridae). The workshop was attended by about 50 California Current researchers and agency representatives, as well as researchers for other eastern boundary currents. A final report is forthcoming, and about a dozen papers presented and discussed at the workshop will be published in *Journal of Marine Systems*. Contact **David Ainley** ([dainley@penguinscience.com](mailto:dainley@penguinscience.com)) for more information.

Restoration and monitoring of seabird habitat at West Cliff Drive, Santa Cruz, CA was expanded in 2013 under the management of **Bill Henry** (USGS,

Oikonos), **Josh Adams** (USGS), and **Ryan Carle** (Oikonos). Invasive ice plant (*Carpobrotus edulis*) in this area can limit seabird nesting habitat, by overgrowing crevices where Pigeon Guillemots nest and the flat coastal terraces used by Brandt's Cormorants. The project removed ice plant from four plots on this popular stretch of coast and restored the native coastal plant community. 2013 was the third year that citizen scientist **Alayne Meeks** monitored population and productivity of Brandt's Cormorants nesting adjacent to restoration plots.

**Jeff Davis**, **Phil Capitolo**, **Dave Lewis**, **Bill Henry**, **Peter Gaede**, and **Glenn Ford** (UCSC; **Breck Tyler**, Principal Investigator) continued to conduct aerial surveys of marine birds and mammals over California continental shelf waters in 2012, under contract with CDFG-OSPR (**Laird Henkel** and **Holly Gellerman**). The surveys are designed to collect baseline distribution and abundance data, and to maintain rapid-response capabilities for oil spills. During the past year, surveys were conducted from Del Norte to San Diego counties. The team (**Glenn Ford**, Principal Investigator), along with **Mike Parker**, also continued to provide aerial survey support to USFWS for studies related to the *Deepwater Horizon* oil spill in the Gulf of Mexico.

**Hannah Nevins** and **Stori Oates** (University of California Davis [UCD] and CDFG) are working on a multi-year study of the thermal dynamics of oiled seabirds during the rehabilitation process. Focusing on alcids and grebes (Podicipidae), they are using an infrared camera and thermal Passive Integrated Transponder (PIT) tags to measure changes in heat loss relative to environmental and behavioral changes throughout the 24-hour day. This project is supported by CDFG's Oil Spill Response Trust Fund, through the Oiled Wildlife Care Network at the Wildlife Health Center, School of Veterinary Medicine, UCD. Other collaborators are the San Francisco Oiled Wildlife Care and Education Center, Fairfield, CA and



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the Los Angeles Oiled Bird Care and Education Center, San Pedro, CA.

**Kyra Mills** (Oiled Wildlife Care Network, UCD) is studying post-release survival and migratory patterns of Western Grebes (*Aechmophorus occidentalis*) captured in San Francisco Bay. Collaborators are **Joseph Gaydos**, **L. Ignacio Vilchis** (SeaDoc Society), **Christine Fiorello**, **Emily Whitmer**, **Michael Ziccardi** (Oiled Wildlife Care Network, UCD), **Susan De La Cruz**, and **Dan Mulcahy** (USGS).

### MORTALITY AND NON-OIL POLLUTION

Coastal Ocean Mammal and Bird Education and Research Surveys (BeachCOMBERS) is coordinated and managed by **Hannah Nevins** and **Erica Donnelly-Greenan**, headed by Principal Investigator **Jim Harvey**. The program surveys beaches in the Santa Cruz, Monterey, and San Luis Obispo County systematically, to determine human and natural impacts on marine birds and mammals in our coastal ecosystem. Project leaders completed a volunteer training session at MLML in September 2013. In January 2013, a new Southern Chapter of BeachCOMBERS was initiated that covers San Luis Obispo County south to Leo Carillo State Beach, Los Angeles County. The Southern Chapter is headed by **Robert McMorran** of USFWS.

The Biological Indicators of Ocean Plastic Pollution Program (BiOPS) of Oikonos in Santa Cruz includes researchers **Hannah Nevins**, **Erica Donnelly-Greenan**, and **Jessie Beck**. They continue to track trends in plastic ingestion by procellariids: albatrosses (*Phoebastria* spp.), Northern Fulmars (*Fulmarus glacialis*), and shearwaters (*Puffinus* spp.). Specimens originate as (1) bycatch in commercial fisheries in Alaska and Hawai'i, and (2) carcasses collected from beach surveys in the Monterey Bay National Marine Sanctuary. In 2012–2013 we added data to the long-term monitoring program, and we are preparing a review paper on plastic ingestion for scientific

publication. In October 2013, **Erica Donnelly-Greenan**, **Jim Harvey**, **Hannah Nevins**, **Michelle Hester**, and **William Walker** submitted "Prey and Plastic Ingestion of Pacific Northern Fulmars (*Fulmarus glacialis rogersii*) from Monterey Bay, California."

The Marine Seabird Health Study is entering its eighth year, coordinated by **Hannah Nevins** (UCD), with **Melissa Miller** (UCD and CDFW-OSPR), **Laird Henkel** (CDFW-OSPR), and **Erica Donnelly-Greenan** and **Jessie Beck** (Oikonos). The project is housed at CDFG's Marine Wildlife Veterinary Care and Research Center in Santa Cruz (MWVCRC). It aims to provide a quantitative demographic assessment of disease, chronic oiling, plastics and other mortality factors affecting seabirds in CA, using specimens from beach surveys, fishery bycatch, and rehabilitation centers. The goal is to provide a regional information center for federal, state, and local resource managers, and is supported in part by CDFG-OSPR, Moss Landing Marine Labs (MLML), UCD's Wildlife Health Center, Oikonos Ecosystem Knowledge, NOAA, and USFWS. Since 2005 the program's staff have necropsied more than 3,400 specimens representing 76 species.

In 2013, the Marine Seabird Health Study at MWVCRC, in collaboration with **Michelle Hester** (Oikonos) and supported by NFWF and NOAA, continued investigating the demographics of seabird bycatch and the incidence of plastic ingestion by Northern Fulmars and other species collected as bycatch by NOAA's fishery observer programs in Hawai'i and Alaska)

### EDUCATION AND OUTREACH

**Sage Tezak** and **Karen Reyna** (NOAA-Gulf of the Farallones National Marine Sanctuary) coordinated activities of the Seabird Protection Network (SPN). Since August 2005, SPN has conducted outreach that targets pilots, boaters and general ocean users, in an effort to reduce human disturbance to breeding seabird colonies along the cen-

tral CA coast. A Wildlife Disturbance Reporting Packet has been developed in order to (1) help resource managers target education efforts, (2) track repeat offenders, and (3) target enforcement efforts. The packet includes: a Wildlife Disturbance Reporting Form, protocols for reporting a wildlife disturbance incident, instructions on filling out the reporting form, and a matrix describing wildlife laws, regulations and responsible authorities. For more information, or to obtain a Wildlife Reporting Packet, contact [California.Seabirds@noaa.gov](mailto:California.Seabirds@noaa.gov).

Stewards of the Coast of Redwoods, with support from the BLM and the Gulf of the Farallones National Marine Sanctuary, established the first Seabird Protection Network that is not funded by maritime oil spill funds through the Natural Resource Damage Assessment (NRDA) process. The new chapter covers the Sonoma County coast, from Bodega Bay northward. This community-based team of volunteers has focused initially on monitoring seabirds at Bodega Head Island. Their website is [http://www.stewardsofthecoastandredwoods.org/st\\_seabirdmonitoring.htm](http://www.stewardsofthecoastandredwoods.org/st_seabirdmonitoring.htm)

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## SOUTHERN CALIFORNIA

Compiled by **Annette Henry**

### COLONY STUDIES

**Charles Collins** (emeritus, California State University, Long Beach) read the bands on Caspian Terns (*Hydroprogne caspia*) and Black Skimmers (*Rhynchops niger*) as part of long-term survival analysis. Among those seen in 2013 were two 20-year-old Caspians and one 23-year-old skimmer. The observations are continuing.

**Kathy Keane** (Keane Biological Consulting) and her colleagues **Nathan Mudry**, **Wally Ross**, **Matt Teutimez**, **Bob Schallmann**, **Nick Liberato**, and **Santiago Lopez** continue to oversee the nesting site for the endangered

## REGIONAL REPORTS FOR 2013 • Southern California

California Least Tern (*Sternula antillarum browni*) at Los Angeles Harbor, as well as nesting at the site by Caspian Terns, Elegant Terns (*Thalasseus elegans*), and Black Skimmers. Kathy is also finalizing a research project for the U.S. Army Corps of Engineers regarding California Least Tern foraging near more than 20 Corps dredging locations in southern California. She lives part-time on the east coast of Baja, where she watches Magnificent Frigatebirds (*Fregata magnificens*), Yellow-footed Gulls (*Larus livens*) and other species, leads bird walks, and presents talks about bird identification and conservation.

In 2013, Point Blue Conservation Science (formerly PRBO) completed its 15th year of seabird monitoring at Vandenberg Air Force Base (VAFB), central California. Focal species include Pelagic Cormorant (*Phalacrocorax pelagicus*), Brandt's Cormorant (*P. penicillatus*), Pigeon Guillemot (*Cephus columba*), Western Gull (*Larus occidentalis*), California Least Tern, and Black Oystercatcher (*Haematopus bachmani*). Monitoring focuses on how these species utilize coastal and nearshore habitats for breeding, roosting, and foraging, with emphasis on seabird use of California's newly established marine protected areas (MPAs). Additionally, estimated rates of human-caused disturbance to breeding and roosting sites are used to inform outreach and law enforcement efforts of the Seabird Protection Network (SPN). MPA and SPN initiatives have helped expand this program along the coast from Point Piedras Blancas to the Tijuana River estuary, including Santa Cruz Island. Program staff for 2013 included **Dan Robinette**, **Julie Howar**, **Steven Tuckerb Bernardo Alps**, **Katharine Goodenough**, **Tom McIntyre**, **Harrison**, **Hyatt**, and **Tomas Barcinas**. Noteworthy results from 2013 included continued rapid growth of the Brandt's Cormorant colony that was established at VAFB in 1995; return of average to above-average reproductive success for many Least Tern colonies, after anomalously low reproductive success throughout southern California in 2012;

and continued below-average success for Western Gulls and Black Oystercatchers at VAFB, which began in 2004.

In the Channel Islands National Park, reproductive monitoring was conducted as follows: Santa Barbara Island—Scripps's Murrelets (*Synthliboramphus scrippsi*), Cassin's Auklets (*Ptychoramphus aleuticus*), Ashy Storm-petrels (*Oceanodroma homochroa*), Brown Pelicans (*Pelecanus occidentalis*), Brandt's Cormorants, Pelagic Cormorants, and Double-crested Cormorants (*Phalacrocorax auritus*); Santa Cruz Island—Cassin's Auklets, Ashy Storm-Petrels, and Western Gulls (*Larus occidentalis*); and Anacapa Island—Brown Pelicans, Scripps's Murrelets, Cassin's Auklets, and Ashy Storm-Petrels. Staff for each island are named under "Restoration," below.

### RESTORATION

In the Channel Islands National Park (CINP), the California Institute of Environmental Studies (CIES; **Laurie Harvey**) and the National Park Service (**Dan Mazurkiewicz**) continued to implement seabird restoration projects under the Montrose Settlements Restoration Program (MSRP) with multiple partners. On Santa Barbara Island, alcid habitat restoration is ongoing to benefit Scripps's Murrelets and Cassin's Auklets. This project is scheduled to continue through at least 2017. Concurrent studies included: (1) the effects of Barn Owl (*Tyto alba*) predation on nesting (**Sarah Thomsen**, Simon Fraser University), and (2) use of nest cameras to investigate breeding biology of Scripps's Murrelets (in collaboration with **Nina Karnovsky**, Pomona College). Reproductive monitoring for these and other species was conducted as in previous years.

On Santa Cruz Island, two ongoing MSRP projects to benefit Cassin's Auklets and Ashy Storm-Petrels were continued with partners **Josh Adams** (US Geological Survey), **Franklin Gress** (CIES), **Bill McIver** (U.S. Fish and Wildlife Service), **Harry Carter** (Carter Biological Consulting; CBC), and **Karen Flagg** and **Don Hartley**

(Growing Solutions). Habitat restoration on Scorpion Rock is ongoing; native plant percent cover to support expanded Cassin's Auklet nesting is approaching target goals, with several additional years of site maintenance work (weeding and monitoring) needed to complete plant community restoration. Social attraction and disturbance reduction efforts for the Ashy Storm-Petrel were continued in the sea caves and offshore rocks of Santa Cruz Island. The nesting colony at Orizaba Rock has responded positively to restoration efforts. Concurrent studies included: (1) investigation of the demographics of the Ashy Storm-Petrel using platform transmitting terminal (PIT) tags, (2) audio studies using Acoustic Recording Units (ARUs) of the Ashy Storm-Petrel at nesting colonies, and (3) evaluation of the impacts of predation by Common Ravens (*Corvus corax*).

A feasibility study on the status of Ashy Storm-Petrels, Scripps's Murrelets, and Cassin's Auklets at Anacapa Island in 2011–12 was completed by collaborators **Matthew McKown** (University of California, Santa Cruz), **Harry Carter** (CBC), and **Franklin Gress** and **Mike Parker** (CIES), to determine restoration potential. This study resulted in the first documented Ashy Storm-Petrel nest on Anacapa Island (in 2011). A summary report of findings was completed this year; future restoration work is being considered under Phase 2 of the MSRP plan.

### PELAGIC RESEARCH

Since 2011, the Southwest Fisheries Science Center (SWFSC) of the National Oceanographic and Atmospheric Administration (NOAA), La Jolla, has had no ship time for continuing our time series of cetacean and ecosystem assessment surveys in the Pacific. (We are hopeful for 2014). These surveys were the platforms on which seabird data were historically collected.

Seabird research by **Lisa T. Balance** and **Robert Pitman** (SWFSC) has therefore focused on mining existing data, largely through collaborations with graduate students. **Summer Martin**, a doctoral student at Scripps



Institution of Oceanography (SIO), is quantifying ecosystem services to compare extractive with existence values (including existence values for seabirds) in the eastern tropical Pacific.

**Trevor Joyce**, a doctoral candidate working with **Lisa T. Ballance** at SIO and SWFSC, continued research on the oceanic distribution, feeding ecology, and marine abundance of common and threatened seabird species, employing SWFSC's extensive time series of seabird transects surveys in the Central and Eastern Pacific. He used strip-transect data to estimate absolute abundance for Newell's Shearwater (*Puffinus newelli*) and Hawaiian Petrel (*Pterodroma sandwichensis*) in the eastern and central tropical Pacific. He also used flock data to investigate El Niño/Southern Oscillation (ENSO) effects on seabirds in the eastern tropical Pacific. For his research on Newell's Shearwater colonies in Hawai'i, see that regional report.

**R. Cotton Rockwood**, a doctoral student at SIO, in collaboration with **Lisa Ballance**, is assembling a map of the major at-sea anthropogenic threats to seabirds in the North Pacific. They are using a geographic information system to create a spatially explicit tool to inform conservation and management. They are focusing on the North Pacific, and the maps include these measures of threats: organic pollution, inorganic pollution, shipping, marine debris, large oil spills, bycatch, fisheries competition, fisheries ecosystem disturbance, sea surface temperature change, and wind speed change. By identifying the intensity and number of threats co-occurring across space, the maps will identify regions of high and low concern with regard to anthropogenic impacts. Additional comparisons will be made for important ecological regions such as the California Current, Bering Sea, and the North Pacific transition zone, as well as among established, pending and recommended Important Bird Areas. A manuscript is in preparation.

Parts of the work were presented in a talk, "Patterns of At-sea Anthropogenic Threats to Seabirds in the North Pacific: A Comparison of Laysan Al-

batross and Sooty Shearwater" at the Pacific Seabird Group annual conference in Portland, OR, February 2013.

**Ballance** and **Pittman** are pursuing a multinational effort with colleagues from Central American countries to investigate the role of the Costa Rica Dome in the greater eastern tropical Pacific, including its importance to seabirds.

**Annette Henry** continues to look at the distribution of select seabird species within the eastern tropical Pacific and California Current, using data collected by the SWFSC as part of their cetacean and ecosystem assessment surveys. She also works on Eared Grebes (*Podiceps nigricollis*) and loons (*Gavia* spp.) with **Joseph Jehl** (Smithsonian Institution), with a focus on migration energetics and physiology (Jehl and Henry, J Avian Biology 44: 97, 2013).

## HAWAI'I

Compiled by **Annette Henry**

### REHABILITATION

**Rae Okawa**, Development Coordinator for the Hawai'i Wildlife Center (HWC), reports that the Center celebrated its one-year anniversary in September. Seabirds admitted to HWC for treatment and rehabilitative care included juvenile Red-footed Boobies (*Sula sula rubripes*), Black-winged Petrels (*Pterodroma nigripennis*), endangered Hawaiian Petrels (*P. sandwichensis*), Leach's Storm-Petrels (*Oceanodroma leucorhoa*), Wedge-tailed Shearwaters (*Ardenna pacifica*, formerly *Puffinus pacificus chlororhynchus*), Laysan Albatross (*Phoebastria immutabilis*), one Newell's Shearwater (*Puffinus newelli*), and a Sooty Shearwater (*P. griseus*). A variety of other shorebirds, waterbirds, and birds of prey were also admitted. Birds were received from all main Hawaiian Islands. The HWC now has a wildlife technician on staff to assist with the increasing numbers of wildlife being brought to the Center.

Statewide response, training and capacity-building continued this year.

President and Center Director **Linda Elliott** led wildlife emergency response trainings on O'ahu, a statewide avian botulism training on Hawai'i Island, Kaua'i, Maui, O'ahu and Moloka'i, and a seabird fallout response preparedness training on Lāna'i. Assistance was also provided to Rota in the Commonwealth of the Northern Mariana Islands for a seabird epizootic. In addition, HWC has developed a wildlife rehabilitation training program at the HWC facility and welcomed two biologists from American Samoa to its inaugural class.

### COLONY AND PELAGIC STUDIES

**Melinda Conners** (doctoral student of **Scott Shaffer** at the University of California Santa Cruz (UCSC), and a Nancy Foster fellow, has completed fieldwork for her dissertation at Tern Island, French Frigate Shoals, Northwest Hawaiian Islands. She has been focusing on the diets and foraging ecology of Laysan Albatross (*Phoebastria immutabilis*) and Black-footed Albatross (*P. nigripes*). The start of the 2012–2013 breeding season marked the 11th season of research on the albatrosses at Tern Island, but a weather-related disaster closed the island just as research was getting underway. It is unclear when (or if) Tern Island will reopen for research activities. **Shaffer** is continuing to study the foraging ecology of Laysan and Black-footed Albatrosses from Midway Atoll, in collaboration with **Maura Naughton** and **John Klavitter** of USFWS. Shaffer is also co-advising **Sarah Gutowsky** from Dalhousie University in Nova Scotia, Canada. Sarah is comparing the foraging ecology of albatrosses (*Phoebastria* spp.) from multiple colonies in the Northwest Hawaiian Islands.

**Trevor Joyce**, a doctoral candidate working with **Lisa T. Ballance** of the Southwest Fisheries Science Center in California, completed his third and final year of fieldwork assessing the habitat use of Newell's Shearwater and its breeding and non-breeding season distributions from Kaua'i, Hawai'i, using Global Location System (GLS) tags. The species is listed as endangered by the International Union for the Conservation of Nature.



## REGIONAL REPORTS FOR 2013 • Hawai'i

**David Duffy** is the proud co-author on a paper by **Aly McKnight**, et al. on the role of upwellings in the migration of Alaskan Arctic Terns (*Sterna paradisaea*) (*Mar Ecol Progr Ser* 491: 253, 2013). He is also the lead author on a more modest account of how Arctic Terns cross the Andes on their southern migration from Chile to reach the rich area off Chubut Province, Argentina. **Duffy** is still contemplating how to do his bucket-list project of looking at nesting vegetation and ecology of nesting seabirds in the Northwestern Hawaiian islands and more tropical atolls. Unfortunately access seems to be getting harder and harder, thanks to budget cuts and political difficulties in Congress.

The Maui Nui Seabird Recovery Project (MNSRP) seeks to quantify seabird use and colony distribution as well as to protect and enhance seabird populations and habitat. Within Maui County, the MNSRP carried out the following seabird research and management activities:

For the Wedge-tailed Shearwater, they studied adult foraging range while provisioning chicks, using short-term (one- to six-day) GPS deployments and recoveries (**Isabelle Walker**, **David McPherson**, and **Jay Penniman** on Maui. A broader Hawaiian effort was led by **Josh Adams**, USGS). Other research projects included: (a) Monitoring reproductive success at one Maui colony (**Victoria Stout**, **Isabelle Walker**, and **Jay Penniman**); (b) Annual monitoring of colony size and activity at five Maui County colonies (**Victoria Stout**, **Isabelle Walker**, and **Jay Penniman**); and (c) Creating a banded population to test a source/sink hypothesis for Maui County offshore islets and Maui, Moloka'i, and Lāna'i, by banding pre-fledging chicks annually, and recapturing adults returning to the colonies in spring (**Fern Duvall**, State of Hawai'i, Division of Forestry and Wildlife, **Jay Penniman**, and **Isabelle Walker**).

MNSRP studied adult ranging behavior of the Hawaiian Petrel during the non-breeding season, using GLS tag deployments during the breeding season

and recoveries the following year. They also sampled for stable isotopes and genetic analysis. (Isotopes: **Peggy Ostrom**, Michigan State University and **Anne Wiley**, Akron State University, with **Marie VanZandt**, **Jay Penniman**, **Fern Duvall**, **Isabelle Walker**, **David McPherson**, **Zane de la Cruz**, **Grazel Caceres**, and **Alicia Rhoades**; genetic analysis: **Rob Fleischer** and **Helen James**, Smithsonian Institution). Colony research focused on reproductive success monitoring at one Lāna'i colony (**Isabelle Walker** and **Jay Penniman**); for other projects see "Conservation and restoration," below. On Lāna'i, MNSRP conducted inventory surveys for seabird presence or absence in Upper Kahikinui, Maui (**Marie VanZandt**, **Alicia Rhoades**, **David McPherson**, **Isabelle Walker**, **Jay Penniman**, and **Matthew McKown**, Conservation Metrics).

For Newell's Shearwater, **Marie VanZandt**, **Alicia Rhoades**, **David McPherson**, **Isabelle Walker**, **Jay Penniman**, and **Matthew McKown** did inventory surveys of seabirds and their predators in Upper Kahikinui, Maui.

MNSRP conducted inventory surveys for presence or absence of Band-rumped Storm-Petrels (*Oceanodroma castro*) in Upper Kahikinui, Maui. Personnel included **Marie VanZandt**, **Alicia Rhoades**, **David McPherson**, **Isabelle Walker**, **Jay Penniman**, and **Matthew McKown**. Inventory surveys for predators of seabirds in Upper Kahikinui, Maui were conducted by **David McPherson**, **Alicia Rhoades**, **Isabelle Walker**, and **Jay Penniman**. Surveys for seabirds included ground searches, nighttime auditory surveys, night-vision and thermal imaging observations, and remote audio recording stations using song meter technology.

The Kaua'i Endangered Seabird Recovery Project (KESRP) is a project of the Hawai'i Division of Forestry and Wildlife (DOFAW), administered through the Pacific Studies Cooperative Unit of the University of Hawai'i. **Andre Raine** provided an update on a project focused on three endangered seabirds on

Kaua'i: Newell's Shearwater, Hawaiian Petrel and Band-rumped Storm-Petrel. At an island-wide scale, the project has continued to conduct annual radar surveys at 15 permanent radar sites to assess long-term population trends of both Newell's Shearwater and Hawaiian Petrel—trends that continue to show a long-term decline.

The majority of work conducted by the KESRP project in 2013 was funded through a State Wildlife Grant or the Kaua'i Island Utility Cooperative (KIUC) Short-term Habitat Conservation Plan. Auditory survey work continued in previously unsurveyed areas and new seabird colonies of all three species were discovered. Song meters were deployed at new sites for a month at a time as a tool to identify new breeding areas for the target species. The project also continued to monitor two seabird colonies in conjunction with introduced predator control and habitat management work. The first site is the Upper Limahuli Preserve, in collaboration with the National Tropical Botanical Gardens, where a total of 17 Hawaiian Petrel and 43 Newell's Shearwater burrows have been identified to date. The second site involves three management areas within the Hono o Na Pali Natural Area Reserve System (NARS), in collaboration with NARS staff. A total of 84 Hawaiian Petrel and 7 Newell's Shearwater burrows were identified. Burrows monitored in these areas helped to assess the effectiveness of management work at the sites. Monitoring methods included the use of remote cameras on burrows, static song meters recording at fixed sites on an annual basis and standardized auditory survey techniques using binoculars, infrared and night vision.

Five satellite tags were attached to adult Hawaiian Petrels in August 2013, in collaboration with USGS Western Ecological Research Center (funded by the Bureau of Ocean Energy Management) to investigate the foraging locations of birds provisioning chicks. At the time of writing, two tags were still transmitting (the other three had been retrieved), with birds traveling thousands of kilometers northward.

At Kilauea Point National Wildlife Refuge (KPNWR) on Kaua'i, 14 Newell's Shearwater burrows were monitored in 2013, with at least 6 chicks present as of November 2013. For more information on the project, see the website at <http://kauaiseabirdproject.org/> or the Kaua'i Endangered Seabird Recovery Project Facebook page.

**David Hyrenbach**, with the Pelagicos lab at Hawai'i Pacific University, reports that graduate student **Shannon Lyday** defended her thesis research, "Shearwaters as Ecosystem Indicators: Connecting Predators in the California Current" in October 2013. **Pam Michael**, who graduated from the lab in 2011, has published her thesis chapter: Michael, P.E., et al. 2013. Relative influence of static and dynamic features on black-footed albatross (*Phoebastria nigripes*) habitat use in central California Sanctuaries. *Fisheries Oceanography*, DOI: 10.1111/fog.12039.

**Beth Flint** (U.S. Fish and Wildlife Service [USFWS], Honolulu) participated in the US team (**Ed Melvin**, **Mi Ae Kim**, and **Marlene Menard**) that attended the meetings of the 7th meeting of the Advisory Committee of ACAP (Agreement on the Conservation of Albatrosses and Petrels) in La Rochelle, France in May 2013. She provided information about the North Pacific albatrosses, which are listed as ACAP species, at the meeting of the Population and Conservation Status Working Group, of which she is a member.

#### CONSERVATION AND RESTORATION

**David Duffy** and **Lindsay Young** are nearing completion of a review of the effects of climate change on Hawaiian seabirds, which has been chronically in preparation. **Duffy** is also finishing a paper on how to detect mongoose (*Herpestes javanicus*), which may or may not have established a resident population on Kaua'i, representing a major new threat to burrow-nesting Newell's Shearwater and Hawaiian Petrels.

**Lindsay Young** of Pacific Rim Conservation (PRC) is working on a second predator-proof fence, this one at

Kilauea Point National Wildlife Refuge (KPNWR) on Kaua'i. Collaborators are the American Bird Conservancy (ABC), USFWS, and the Kaua'i Endangered Seabird Recovery Project. This fence will provide sanctuary to a seabird species that is in rapid decline and largely (>90%) endemic to Kaua'i. She will begin with preparations necessary to translocate Newell's Shearwaters to the site, once it is secure from predators. This fence will build on the previous success of Hawai'i's first predator-proof fence at Kaena Point, O'ahu, which has seen a doubling in seabird productivity as well as colonization by a new species in its first three years.

**Jessi Hallman Behnke** (PRC) performed ecological monitoring for the Nihoku Ecosystem Restoration Project at KPNWR on Kaua'i, under the direction of **Lindsay Young**, and in partnership with the ABC, USFWS, and KESRP. Within the nearly 8-acre site, baseline data were collected quarterly on soils, plants, invertebrates, birds, rodents, cats, and other potential predators, in preparation for the construction of the predator-proof fence. In the project's second year, Jessi will experiment with Christmas berry (*Schinus terebinthifolius*) removal, and aid in the design of a restoration plan geared toward the 2015 translocation of Newell's Shearwater chicks to the site once it is secure from predators.

Along with **Eric VanderWerf**, **Young** continued to monitor Laysan Albatrosses (*Phoebastria immutabilis*) and Wedge-tailed Shearwaters at Kaena Point Natural Area Reserve on O'ahu, as well to monitor and manage threats of Red-tailed Tropicbirds on O'ahu. **Young** is also participating in a multi-species tracking project, to determine pelagic habitats for use in considering applications for wind energy permits. Species include Wedge-tailed Shearwaters, Red-tailed Tropicbirds (*Phaethon rubricauda*), and Red-footed Boobies. Project partners are U.S. Geological Survey (**Josh Adams**), Oikonos (**Michelle Hester**), DOFAW (**Amarisa Marie**), and Hawai'i Pacific University (**David Hyrenbach**).

At a Hawaiian Petrel colony on Lāna'i, MNSRP undertook predator control of feral cats (*Felis sylvestris*), rats (*Rattus* spp.), and Barn Owls (*Tyto alba*) (**Zane de la Cruz**, **Grazel Caceres**, and **David McPherson**); invasive plant control in the seabird colony (**Zane de la Cruz**, **Jay Penniman**, **James Leary**, **Marie VanZandt**, **Alicia Rhoades**, and **Isabelle Walker**); and inventory surveys for predators of seabirds in Upper Kahikinui, Maui (**David McPherson**, **Alicia Rhoades**, **Isabelle Walker**, and **Jay Penniman**).

MNSRP coordinates Maui's Save Our Seabirds program, which rescues seabirds during the fall fledging "fallout" season (**Jay Penniman**, **Alicia Rhoades**, **Isabelle Walker**, **David McPherson**, and **Victoria Stout**). The MNSRP provides public outreach programs and awareness of seabird light distraction (i.e., bus posters, theater ad campaign, radio ads, etc.). They also respond to reports of "fallout," and they triage, treat, transport and release downed seabirds. They document fallout locations with GPS, and sources of seabird distraction that contribute to fallout, including unshielded lights and aerial wires.

The KESRP project of DOFAW (see under "Colony and pelagic studies," above) also addresses the effects of powerline collisions and light attraction. Song meters are proving to be a promising technique for recording the sound of birds hitting power lines, as observers also verified mortality using extensive radar surveys, ground searches for downed birds, and both carcass removal and searcher efficiency trials. Data collection and analysis for this aspect of the project is ongoing.

**David Hyrenbach**, with the Pelagicos lab at Hawai'i Pacific University ([www.facebook.com/pelagicos](http://www.facebook.com/pelagicos)), pursued three lines of seabird research in 2013: (1) Documenting the patterns and impacts of plastic ingestion by North Pacific seabirds; (2) advancing the conservation of Wedge-tailed Shearwater (3) collaborating on an archipelago-wide seabird tracking study.



The plastic ingestion research involves opportunistic sampling of seabirds from the main Hawaiian Islands, and focused studies of Laysan Albatross and Tristram's Storm-Petrel (*Oceanodroma tristrami*) from Tern island (north-western Hawaiian Islands) by graduate students **Sarah Youngren** and **Dan Rapp**. Wedge-tailed Shearwaters are being studied at O'ahu's Freeman Seabird Preserve, in collaboration with Hawai'i Audubon. We have been monitoring developing chicks and studying the diving behavior of provisioning adults. With support from DOFAW, we have also completed two years of shearwater fallout surveys along the southeast O'ahu shoreline, with ongoing work during the 2013 fledging season. The tracking study is described earlier in this section.

## NON-PACIFIC UNITED STATES

Compiled by **Iain Stenhouse**

### PELAGIC SURVEYS

**Dick Veit**, **Tim White**, and **Simon Perkins** (City University of New York [CUNY]) continued aircraft surveys for seabirds off southeastern Massachusetts, and conducted a special set of aerial surveys for post-breeding Roseate Terns (*Sterna dougallii*) in the same general area during July–September 2013. This group continues collaborative work with the Biodiversity Research Institute (BRI) on seabird surveys off Virginia and Maryland (see below), and ship-based surveys off the US east coast with the U.S. Fish and Wildlife Service (USFWS).

Funded by the Department of Energy, BRI continues its second year of broad-scale baseline surveys for marine birds, marine mammals, and sea turtles in the mid-Atlantic region, using a combination of aerial surveys (employing high-definition videography) and boat-based surveys. High-definition video is proving to be an effective method, capturing distribution and

abundance information on a broad range of marine taxa from a single survey platform. Among others, **Iain Stenhouse** (BRI), **Richard Veit** (CUNY), and **Beth Gardner** (North Carolina State University [NCSU]) are co-project investigators (PIs) on the broader study.

**Tim White** is currently working as a guest investigator with **Gareth Lawson** and **Peter Wiebe** (Woods Hole Oceanographic Institute). They are examining the associations between seabirds and cetaceans with prey and hydrographic features at the northwest Atlantic shelf break.

**Holly Goyert** defended her PhD thesis on foraging associations among terns, cetaceans, and tunas, and has accepted a post-doctoral research position in **Beth Gardner's** lab at NCSU.

In partnership with USFWS, **Iain Stenhouse**, **Andrew Gilbert**, **Kate Williams**, and **Wing Goodale** (BRI) will conduct aerial surveys for waterfowl, shorebirds, and other avian species in the New York waters of Lake Erie in the fall of 2013 and spring of 2014. These surveys are carried out at the request of the Great Lakes Commission (GLC), as part of their ongoing avian studies in the broader region.

The Atlantic Marine Assessment Program for Protected Species (AMAPPS) is a multi-agency project that includes the US Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration [NOAA], Bureau of Ocean Energy Management, and the US Navy. The project's purpose is to gather baseline information on the distribution and density of marine birds (USFWS), turtles, and mammals (NOAA) in the marine environment. The Division of Migratory Bird Management of USFWS is in the 4th year of aerial seabird surveys, using transects perpendicular to the coast, out to a distance of 30 m or to 50 nm (92 km) from the coast. During these surveys, all seabirds, sea turtles, and marine mammals are counted. Surveys have included: in 2010, the south Atlantic coast in summer, and the Wind Energy Areas (WEAs) off Virginia in December; in 2011, the entire Atlantic coast from

Maine to mid-Florida, approximately 7,300 nm (13,500 km); in 2012, the entire Atlantic coast in March and October; and in September 2013, a full survey of the coast, with four USFWS air crews in Kodiak aircraft. Personnel in 2013 were from the Division of Migratory Bird Management and the Coastal Program.

Data from these surveys will provide better scientific information about the distribution and abundance of seabirds in the offshore environment to USFWS and its partners in marine conservation. Specifically, we hope to be able to estimate densities for each transect by season, for common species and/or species groups (e.g., large terns); however, certain species are difficult to identify to the species level in this type of survey. The data also are being provided to other researchers to aid in modeling the exposure component of risk. Risk analyses will be used for regulatory planning when reviewing potential alternative energy leases along the Atlantic Coast. During fiscal year 2014, USFWS is scheduled to fly one more winter survey for seabirds. Contacts are **Tim Jones**, [Tim\\_jones@fws.gov](mailto:Tim_jones@fws.gov) or **Melanie Steinkamp**, USFWS, [Melanie\\_steinkamp@fws.gov](mailto:Melanie_steinkamp@fws.gov).

### MODELING EXERCISES

**Brian Kinlan** of the National Oceanic and Atmospheric Administration's National Centers for Coastal Ocean Science (NCCOS) and **Robert Rankin** (formerly at NCCOS, now at Murdoch University Cetacean Research Unit, Australia) for the past two years to produce been working on seasonal statistical models and high-resolution maps of the estimated long-term average relative occurrence and abundance of approximately 30 marine bird species off the mid-Atlantic U.S. coast, from Cape Hatteras to Cape Cod. He has collaborated on this project over the past 2 years with the U.S. Geological Survey (USGS). Input is based on at-sea survey records in the Atlantic Seabird Compendium database. This project is funded by the Bureau of Ocean Energy Management (BOEM). Maps and models were developed to support spatial planning and environmental



assessment of offshore renewable energy facilities, in particular, offshore wind energy. A final report and digital data package were to be submitted to BOEM in the fall of 2013; it will be available to the public via NCCOS and BOEM websites and appropriate data portals soon after.

In January 2012, **Brian Kinlan** (NCCOS), and **Elise Zipkin**, **Allan O'Connell**, **Mark Wimer**, and **Allison Sussman** (USGS) began a BOEM-funded study of statistical power analysis for marine bird relative abundance and occurrence "hotspot" and "coldspot" detection. The aim was to support statistically based guidelines for timing, frequency, and spatial distribution of marine bird surveys needed to guide placement of offshore renewable energy facilities, such as wind farms, to reduce potential impacts on birds. The first phase of this project was completed in December 2012; the report and supplementary information are available online at <http://www2.coastalscience.noaa.gov/publications/search.aspx> (search for "avian sampling"). The second phase of this project involves further development of species-specific statistical guidelines for hotspot and coldspot detection over the next two years, in collaboration with USGS and Michigan State University.

In 2013, **Brian Kinlan** and **Arliss Winship** (NCCOS) also launched the next phase of a marine bird mapping and modeling effort, expanding the scope to the entire US Exclusive Economic Zone from Maine to Florida. Funded by BOEM and in cooperation with USGS, USFWS, and other federal, public, academic, and non-governmental organizations partners, NCCOS will conduct integrative statistical modeling and predictive mapping of marine bird distribution and abundance on the Outer Continental Shelf of the US Atlantic coast. Models will be developed using a combination of at-sea marine bird survey data in the Atlantic Seabird Compendium database and marine environmental data records. Models of occurrence and abundance will be integrated with vulnerability and sensitivity indices being produced by other research group, to develop a suite of

high-resolution map products with associated accuracy assessments. These will aid in spatial planning and environmental assessment of offshore wind facilities. Initial results are expected in mid- to late 2014, and final results in late 2015.

#### COLONY-BASED STUDIES

**Steve Kress** and **Paula Shannon** of the National Audubon Society's Seabird Restoration Program (NAS-SRP) continued long-term monitoring of breeding seabird populations in the Gulf of Maine. They focused on diet studies, productivity, growth, and populations of terns (*Sterna* spp.), Atlantic Puffins (*Fratercula arctica*), Razorbills (*Alca torda*), and Black Guillemots (*Cephus grylle*). To track winter movements of Atlantic Puffins, 13 geolocators were deployed on breeding adults. In partnership with the nonprofit explore.org, NAS-SRP deployed four high-definition cameras that streamed live video of nesting puffins, terns, and Osprey (*Pandion haliaetus*) to the internet.

Audubon's internship training program continued, with interns from 12 states and three countries.

#### TRACKING STUDIES

**Linda Welch** (USFWS) and colleagues at Maine Coastal Islands National Wildlife Refuge deployed 10 solar satellite tags on Razorbills breeding at Matinicus Rock. Project objectives were: (1) test the ability to externally attach satellite tags to Razorbills, (2) identify foraging areas of chick-rearing Razorbills, and (3) document at-sea characteristics of foraging habitat (during chick-rearing, migration, and wintering). The team believes this is the first attempt to externally equip Razorbills, which are capable of diving to 120 m, with satellite tags. The birds primarily foraged within 25 km of the breeding colony and were observed feeding on herring and hake. Upon departure from the breeding colony, the birds spent several weeks near a small Razorbill colony located 125 km from Matinicus Rock. The birds may have undergone a post-breeding molt at this location. Linda anticipates

tagging additional Razorbills at multiple breeding colonies in 2014. Data can be viewed at [http://www.seaturtle.org/tracking/index.shtml?project\\_id=881](http://www.seaturtle.org/tracking/index.shtml?project_id=881).

**Iain Stenhouse**, **Lucas Savoy**, **Carrie Gray** (BRI), **Bill Montevecchi** (Memorial University of Newfoundland), **Alicia Berlin** and **Ron Therrien** (USGS) collaborated on a satellite telemetry study of diving bird species wintering in the mid-Atlantic region. Funded by BOEM, and coordinated by USFWS (**Scott Johnson** and **Caleb Spiegel**), this study has been highly successful in tracking the movements of three focal marine bird species—Northern Gannets (*Morus bassanus*), Red-throated Loons (*Gavia stellata*), and Surf Scoters (*Melanitta perspicillata*). Birds were caught at sea in winter specifically to examine their winter use of the mid-Atlantic continental shelf area and their migratory movements in relation to the federally designated Wind Energy Areas off the eastern seaboard. The project team is preparing for a third year of capture and tagging in early 2014.

Tracking of Caribbean seabirds is being continued by **Patrick Jodice** (USGS and Clemson University), **William Mackin** (Guilford College), and a host of collaborators. To date this team has been able to establish tracking efforts on seabird species in the Bahamas (Audubon's Shearwater *Puffinus lherminieri*, White-tailed Tropicbird *Phaethon lepturus*), Jamaica (Masked Booby *Sula dactylatra*), Tobago (Audubon's Shearwater, Red-billed Tropicbird *Phaethon aethereus*), Statia (Red-billed Tropicbird), and Mexico (Masked Booby). In spring 2014, they hope to initiate tracking work on the British Virgin Islands (Magnificent Frigatebird *Fregata magnificens*, Brown Booby *Sula leucogaster*). These efforts were funded by USFWS, National Fish and Wildlife Foundation (NFWF), and other money that the PIs scrounged for and squirreled away! Each project has a collaborator from the home island. Much of the work grew from the Seabird Capacity Building workshop that Jodice, Mackin, **Chris Haney** (Defenders of

Wildlife), and **Lisa Sorenson** and **Ann Sutton** (Society for the Conservation and Study of Caribbean Birds) conducted during summer of 2012 in San Salvador, Bahamas, with funding from NFWF.

The South Carolina Cooperative Research Unit also initiated a project during the spring of 2013, funded by BOEM, to track Brown Pelicans (*Pelecanus occidentalis*) from colonies in Texas, Louisiana, and Florida.

#### OTHER STUDIES AND NEWS

**Jeff Spendelow** (USGS) coordinated a long-term cooperative research project on the meta-population dynamics and ecology of the endangered northwest Atlantic breeding population of Roseate Terns (*Sterna dougallii*). Since 2011, the collaborators have examined the temporal and geographic variation in staging site use in southeast Massachusetts by hatch-year (HY) Roseate Terns, which are given 3-character plastic field-readable (PFR) bands as chicks. Study sites are in Nova Scotia, Maine, New Hampshire, Connecticut, and (new for 2013) New York. Colony-site operators color-banded chicks (and at some places, adults too) at 8 sites in 2013. Three Roseate Terns banded as chicks in 2012 returned to North America in 2013. By mid-September the project collaborators also had seen many returning two-year-olds—more than half of all the former hatch-year birds that were seen on Cape Cod in 2011, and that were expected to have survived until 2013. These new results indicate that a significantly higher percentage of the entire northwest Atlantic Roseate Tern population makes use of this area in July–September than was previously suspected. They could be at risk of hurricanes, oil spills, habitat modification, etc.

Collaborators in this research include **Ellen Jedrey**, **Cris Luttazi**, **Kathy Parsons**, **Karli Rogers** (Massachusetts Audubon's Coastal Waterbird Program), **Mary Hake**, **Nuray Taygan** (CCNS), **Stephanie Koch** (USFWS), and **Edie Ray** and **Jonathan Shuster** on Nantucket Island. Funding support is from the Canadian Wildlife Service.

During a 6-hour period on 31 August, Jeff resighted 68 HYs (representing almost 20% of the Roseate Tern chicks given PFR bands in 2013) and 23 adults with PFR bands on a small section of beach in the northwest section of the Cape Cod National Seashore (CCNS) (the Provincelands area). That gave a total of 91 terns. On 21 August, in the Nauset Estuary area, and on several other days later in the Chatham area of CCNS, Jeff read the “national ring” on a Sandwich Tern (*Thalasseus sandvicensis*) that had been banded as a chick in 2002 on Coquet Island, off the northeast coast of England, UK, possibly representing the first sighting of a European-banded Sandwich Tern in the U.S.

**Iain Stenhouse**, **Andrew Gilbert**, **Kate Williams**, and **Wing Goodale** (BRI) will assist the GLC in integrating existing survey data and developing a research approach designed to understand nearshore and offshore bird populations in the Great Lakes. This will inform decision makers in offshore wind energy development and general conservation planning in the region.

**Brian Kinlan** (NCCOS) is working with a multi-investigator group, including **Andrew Gilbert** (BRI), **Beth Gardner** (North Carolina State University), and **Dick Veit** (CUNY), to integrate various research components toward developing a framework for marine bird risk mapping for wind energy planning in the mid-Atlantic. This is part of a larger project funded by the North Atlantic Landscape Conservation Cooperative.

**Sarah Courchesne** (Seabird Ecological Assessment Network; SEANET) reports that all content for the “Field Guide to Beached Birds of the Southeastern United States” is complete, and the book is now in the hands of a graphic design and layout team. She anticipates the book will be printed and ready for purchase by throngs of eager buyers at the beginning of 2014. This summer, **Sarah & Julie Ellis** (SEANET) authored a presentation delivered at the annual meeting of the Wildlife Disease Association regarding the past winter's severe mortality of some alcids, including the

unprecedented die-off of Atlantic Puffins on the Atlantic coasts of both the US and UK. SEANET staff led this collaborative effort among many scientists and veterinarians from the US and Canada.

With funding from the Maine Outdoor Heritage Fund, **Iain Stenhouse** (BRI) led a one-year project to assess the current degree of mercury contamination across the Gulf of Maine ecosystem, using marine birds as biomonitors. Project partners include **Brad Allen** (Maine Department of Inland Fisheries and Wildlife), **Steve Kress**, **Paula Shannon** (NAS-SRP), and **Linda Welch** (USFWS). Focal species included Common Eider (*Somateria mollissima*), Double-crested Cormorant (*Phalacrocorax auritus*), Black Guillemot, and Leach's Storm-Petrel (*Oceanodroma leucorhoa*).

Evolutionary geneticist **Kevin McCracken** (University of Alaska Fairbanks) has been named the inaugural Kushlan Chair in Waterbird Biology and Conservation at the University of Miami. Kevin will serve a dual appointment as associate professor in the Department of Biology at the College of Arts and Sciences and in the Division of Marine Biology and Fisheries at the Rosenstiel School of Marine and Atmospheric Sciences. His research interests lie at the intersection of population biology, genomics, and physiological genetics. Kevin has also carried out studies on waterbirds as intercontinental carriers for pathogens, such as influenza, and on waterbird systematics.

The Northwest Atlantic Marine Bird Conservation Cooperative met March 6–8, 2013, in Charleston, South Carolina, in conjunction with the Circumpolar Seabird Expert Group (CBird) meeting. The two groups met together for most of the first day and shared national and project updates. Members of the Conservation Cooperative continued their meeting for the following day and a half. Discussions included the highest-priority science needs for marine birds, how to address data gaps, where to focus resources, and pre- and post-construction monitoring for offshore wind projects. A summary of the meeting and copies



of presentations can be found on the Marine Bird Cooperative website at [www.acjv.org/marinebirds.htm](http://www.acjv.org/marinebirds.htm). Contact: **Kirsten Luke**, Atlantic Coast Joint Venture, [kirsten\\_luke@fws.gov](mailto:kirsten_luke@fws.gov)

## CANADA

Compiled by **Ken Morgan**

### PACIFIC CANADA

**Colony studies—Trudy Chatwin** (Ministry of Forests, Lands and Natural Resource Operations [FLNRO], Nanaimo, British Columbia [BC]) reported that the last complete survey of Pelagic (*P. pelagicus*) and Double-crested (*P. auritus*) Cormorants in the Strait of Georgia (SOG), from Mitlenatch Island to the southern Gulf Island, BC took place in 2000. In 2013, Trudy and **Harry Carter** (Carter Biological Consulting, Victoria) resurveyed most cormorant colonies in the SOG, except certain nesting locations in Vancouver and along BC's Sunshine Coast. Because they were unable to survey all locations, Trudy cannot compare the 2013 results with those from 2000. However, the recent survey results do show a marked decline when compared to the counts conducted in 1987; and two islands, Mandarte and Mitlenatch (BC), have become increasingly important nesting locations for cormorants in BC. Trudy also reported that staff of FLNRO is working on over 200 Marbled Murrelet [*Brachyramphus marmoratus*] Wildlife Habitat Areas for Vancouver Island and the BC Central Coast area. And last but not least, Trudy noted that she recently published: Chatwin, T.A., et al, 2013. Set-back distances to protect nesting and roosting seabirds off Vancouver Island from boat disturbance. *Waterbirds* 36(1): 43-52.

**Harry Carter**, along with **Marilyn Lambert** and **Daniel Donnecke** (Victoria Natural History Society), monitored Brandt's Cormorant (*Phalacrocorax penicillatus*) nests at Mandarte Island. Nesting was not previously known at Mandarte, and it is currently the only

breeding location of this species in BC. Harry also reported that he has been collating and reassessing historical information to identify earliest BC breeding records for many species of seabirds, such as Leach's Storm-Petrel (*Oceanodroma leucorhoa*), Fork-tailed Storm-Petrel (*O. furcata*), Black Oystercatcher (*Haematopus bachmani*), Pigeon Guillemot (*Cephus columba*), and others. He is collaborating with **Spencer Sealy** (University of Manitoba [UoM], Winnipeg, Manitoba [MB]) and others. They recently published results in Carter, H.R., et al, 2012. Historical colony status and recent extirpations of burrow-nesting seabirds at Seabird Rocks, British Columbia. *Wildlife Afield* 9:13-48.

**Mark Hipfner** (Wildlife Research Division [WRD], Delta) reported that the summer of 2013 marked the 20th year of the Centre for Wildlife Ecology's seabird research and monitoring program on Triangle Island (BC). The 2013 field crew consisted of **Mark Drever** and **Kevin Fort** (Canadian Wildlife Service [CWS], Delta), **David Green** (Simon Fraser University, Burnaby, BC), **Katie Haman** (PhD student, University of British Columbia, Vancouver, BC), **Catherine Jardine** (Bird Studies Canada [BSC], Delta), and **Katie Studholme** (MSc student, Dalhousie University [DAL], Halifax, Nova Scotia [NS]), in addition to Mark. They monitored breeding chronology and success and related ecological parameters in Cassin's Auklet (*Ptychoramphus aleuticus*), Rhinoceros Auklet (*Cerorhinca monocerata*), Black Oystercatcher, and Glaucous-winged Gull (*Larus glaucescens*). **Glenn Crossin** (DAL, Halifax, NS), **Dan Shervill** (CWS, Delta) and **Strahan Tucker** (Fisheries and Oceans Canada (DFO), Nanaimo, BC), Mark and Katie were involved in a joint DAL-EC project to deploy Global Location Sensing (GLS) logging tags on Rhinoceros Auklets at Triangle, Pine, Lucy and the Moore islands (BC). They also completed the second year of a joint EC-DFO project investigating the consumption of salmon (*Onchorhynchus* spp.) by seabirds in BC waters.

**Laurie Wilson** (CWS, Delta) coordinated the CWS seabird colony monitoring program in 2013. They revisited permanent plots at the Cassin's Auklet colony on East Copper Island and the Ancient Murrelet (*Synthliboramphus antiquus*) colony on George Island (both in Haida Gwaii, BC). Field crew consisted of Laurie, **Glen Keddie** (CWS contractor, Lasqueti Island, BC), and **Erika Lok** and **Courtney Albert** (CWS, Delta).

**Populations—Spencer Sealy** (UoM, Winnipeg, MB) reported that he has summarized information on southern at-sea movements of Ancient Murrelet family groups from northern BC to Oregon (OR), with **Harry Carter**, **Rick Thomson** (DFO, Sidney, BC), **Ken Morgan**, and **Scott Pearson** (Washington Department of Fish and Wildlife, Olympia, Washington [WA]). Spencer worked on summaries of vagrant alcids, with Harry Carter and others. He also became the new editor for the journal *Wildlife Afield*, which has been publishing many papers on seabirds in BC. Spencer's recent publications include: (1) Sealy, S.G., and H.R. Carter, 2012. Rare inter-ocean vagrancy in Crested Auklet and Parakeet Auklet. *Waterbirds* 35:64-73; (2) Sealy, S.G., and H.R. Carter, 2012. Biology and conservation of the Ancient Murrelet (*Synthliboramphus antiquus*) in North America. In Kwon, Y., et al, editors. Status and conservation efforts on murrelets. Proceedings of the 6th International Symposium on Migratory Birds. National Park Migratory Birds Center, Shinan, Korea, pp 25-52; and (3) Sealy, S.G., and H.R. Carter, 2012. Body condition and survival of vagrant Long-billed Murrelets, *Brachyramphus perdix*, in North America. *Can Field-Nat* 126:6-14.

**Restoration—Chris Gill** (Coastal Conservation, Tappen, BC) provided an update of a seabird restoration project that is taking place in Gwaii Haanas National Park Reserve (GHNPR) and the Haida Heritage Site (HHS) (both on Haida Gwaii, BC). Co-leaders of the 5-year project are Chris and **Laurie Wein** (Parks Canada, Skidegate, BC). In



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2009, Parks Canada and the Haida Nation launched a 2-phase program to restore seabird nesting habitat and associated ecosystem processes at islands that are ecologically and culturally significant in the GHNPR, the National Marine Conservation Area Reserve, and the HHS. In Phase 1 (2011), Parks Canada developed partnerships with Coastal Conservation, Island Conservation, and the *Luckenbach* Council to eradicate Norway rats (*Rattus norvegicus*) from Arichika Island and the Bischof Islands (total area approximately 100 ha). Phase 2 commenced in early September 2013 with the aerial broadcasting of brodifacoum (a second-generation anticoagulant rodenticide) on Murchison and Faraday islands in the park (total area approximately 800 ha). The target for phase 2 is the black rat (*R. rattus*). A repeat application took place around the end of September. Overall project goals are to improve or restore nesting populations of Ancient Murrelet, which is listed as Special Concern under Canada's Species at Risk Act (SARA), Cassin's Auklet, and Fork-tailed and Leach's Storm-Petrels. Other species that may also benefit from rat removal are Marbled Murrelet (listed as Threatened under SARA), Black Oystercatcher, and Pelagic Cormorant. Monitoring of rats by remote cameras, live traps and chew blocks will commence after the second application of the rodenticide and will last for two years. Eradication experts who assisted with the project included **Pete McClelland** (New Zealand [NZ] Department of Conservation), **David Gale** (Heliotago, Dunedin, NZ), **Araceli Samaniego Herrera** and **Noé Silva Estudillo** (Conservación de Islas, Ensenada, Mexico), **Gregg Howald** (Island Conservation, Kelowna, BC) and **David Will** (Island Conservation, Santa Cruz, CA).

**Pelagic studies, fishery interactions**— **Caroline Fox** (Raincoast Conservation Foundation and UVIC) reported that she completed her PhD on ecological interactions at Pacific herring (*Clupea pallasii*) spawning events, including those between Bald Eagles (*Haliaeetus leucocephalus*) and several

gull species (*Larus* spp.). Caroline recently started a post-doctoral fellowship investigating the environmental drivers of at-sea distributions and densities of BC's marine birds. With a large data set that spans BC's north and central coast waters, Caroline and collaborators will develop predictive geospatial models for a large suite of seabird species for use in risk assessments and marine planning.

**Bernard Shroeder** (Bernard K. Schroeder Consulting, Nanaimo, BC), conducted vessel line-transect seabird surveys in the Prince Rupert region (BC) for environmental assessment work related to a proposed liquefied natural gas plant and shipping terminal. This work is being conducted for Aecom Environmental (Camarillo, California). A set of surveys was conducted during four seasonal periods to characterize spring migration, summer residents, fall migration, and winter residents. Bernard also conducted Marbled Murrelet radar surveys at the Sarita River on Vancouver Island (BC) to characterize commuting behavior and flight heights. These surveys were conducted for assessment of a proposed run-of-river hydropower project for EDI Environmental Dynamics Ltd (Nanaimo, BC.)

**Laurie Wilson** began a three-year study to better understand the at-sea movements of Ancient Murrelets in BC. Geolocators were attached to 50 breeding adults on George Island and on Suk Gwaii (Frederick Island), Haida Gwaii. The field crew included Laurie, Glen Keddie, Erika Lok, Courtney Albert, and **Rhonda Millikin** (CWS, Delta). Finally, Laurie continued with her assessment of seabird bycatch in commercial gillnet fisheries. Reports of bird entanglements from DFO test fisheries with associated observer programs and bycatch events reported by fishers were tallied. These data will be used to derive seabird bycatch estimates. Seabird surveys were conducted in August and October 2013 in upper Johnstone Strait (BC), to develop estimates of the numbers (and behaviors) of birds attending fishing vessels. Including Laurie, the field crew so far has consisted of **Yuriko Hashimoto**

(CWS, Delta), and **Karen Barry** and **Christopher Di Corrado** (BSC, Delta).

**Ken Morgan** (CWS, Sidney, BC) investigated the spatial/temporal overlap of commercial groundfish fishing and seabirds in Pacific Canada waters. This is in collaboration with two post-docs (**Caroline Fox** (Raincoast Conservation Foundation and UVIC, Victoria, BC) and **Sarah Wong** (Acadia University, Wolfville, NS. **Pat O'Hara** (CWS, Sidney, BC) assisted in the development of predictive models for the distribution of seabirds from at-sea data. Ken has contributed to recent papers, including: (1) Ellis, J.I., et al., 2013. Mortality of Migratory Birds from Marine Commercial Fisheries and Offshore Oil and Gas Production in Canada. *Avian Conserv Ecol* 8(2): <http://dx.doi.org/10.5751/ACE-00589-080204>; and (2) Wong, S.N.P., et al. (*submitted*). Hotspots in cold seas: the composition, distribution and abundance of marine birds in the North American Arctic. *J. Geophys Res—Oceans*.

**Planning, analysis**— **Doug Bertram** (WRD, Delta, BC) worked on population trend analyses of the Marbled Murrelet, with **Mark Drever**, **Bernard Schroeder**, **Dave Lindsay** (Timber-West, Nanaimo) and **Deborah Faust** (consultant, Kingston, Ontario). Doug also reported that he co-authored two papers: (1) on trends in Western Grebes (*Aechmophorus occidentalis*) along the west coast of North America: Wilson, S. et al., 2013. Citizen science reveals an extensive shift in the winter distribution of migratory Western Grebes, *PLoS ONE* 8(6): e65408. doi:10.1371/journal.pone.0065408; and (2) on plastic ingestion: Avery-Gomm, S. et al, 2013. Plastic ingestion in marine-associated bird species from the eastern North Pacific. *Mar Poll Bull* 72: 257–259.

**Louise Blight** (WWF, Vancouver, BC) has been on an extended contract with the World Wildlife Fund Canada (WWF-Canada) to "...address...sundry tasks and publications related to marine conservation." Those tasks have included working on management solutions for underwater noise in BC, reviewing a

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draft federal Update Status Report for Short-tailed Albatross (*Phoebastria albatrus*) in Canada, and sitting on the Advisory Committee for the Bowie Seamount Marine Protected Area (BC).

**Alan Burger** (University of Victoria (UVIC), BC) continued to work on Marbled Murrelet issues in BC, and was the principal author of the draft Marbled Murrelet Recovery Strategy for Canada. Alan also recently completed the Status of Endangered Wildlife in Canada (COSEWIC) update for the Short-tailed Albatross.

**Jo Smith** (Birdsmith Ecological Research, Smithers, BC) continues to work with the Marine Planning Partnership for the North Pacific Coast (MaPP) to develop ecosystem-based marine management plans for the Northern Shelf Bioregion, from just south of Campbell River (BC) north to the Alaska border ([www.mappocean.org](http://www.mappocean.org)). A portal supports planning and contains more than 100 data layers including seabird colonies (source: CWS), at-sea observations of shearwaters (*Puffinus* spp.) and albatrosses (*Phoebastria* spp.), and Marine Important Bird Areas (BSC, Delta). Jo also continues limited work on the Canadian Albatross and Shearwater Recovery Team (**Louise Blight**, **Peter Hodum** [Oikonomos-Ecosystem Knowledge and University of Puget Sound, Tacoma, WA], **Ken Morgan**, and others) to review of an update on status of the Short-tailed Albatross for COSEWIC (written by **Alan Burger**).

### CENTRAL CANADA

**Gail Fraser** (Faculty of Environmental Studies, York University, Toronto, ON) continues to work on Double-crested Cormorants (*P. auritus*) in Lake Ontario.

**Samantha Richman** wrote that she has “finally” landed a permanent job as the Research Scientist at Long Point Waterfowl (BSC, Port Rowan, ON). Sam will be continuing her work with captive Common Eiders (*Somateria mollissima*) and White-winged Scoters (*Melanitta fusca*) at the Livingston Ripley Waterfowl Conservancy (Litchfield, Connecticut), as

well as nutritional ecology of Canada Geese (*Branta canadensis*) and Lesser Snow Geese (*Chen c. caerulescens*) from Akimiski Island (James Bay, Nunavut [NU]). In addition, Sam will be supervising graduate students from the University of Western Ontario (London, ON) on a variety of projects conserving waterfowl and wetlands throughout the Great Lakes.

### ATLANTIC CANADA

**Tony Diamond** (University of New Brunswick [NB]) reported that his lab, the Atlantic Laboratory for Avian Research, continued to work on the seabird community of Machias Seal Island (NB). Following a winter wreck of mostly Razorbills (*Alca torda*), and to a lesser extent, Atlantic Puffins (*Fratercula arctica*), Razorbills had a normal breeding year. In marked contrast, puffins had the latest and worst breeding season in 19-years of monitoring. Twelve (of 26) geolocator tags deployed on puffins in 2012 were recovered, but they had a manufacturing fault that interfered with waterproofing. In other work at the lab, **Kirsten Bowser** has completed her MSc thesis on “NextGeneration” sequencing of a seabird food chain—Atlantic puffins and Atlantic herring (*Clupea harengus*). **Kevin Kelly** is writing his MSc thesis on physiological indicators of health in Atlantic Puffins; **Erin Whidden** (MSc) is deep into a MARK analysis of factors affecting recruitment in puffins; and **Lauren Scopel** is similarly involved with the database on Arctic Terns (*Sterna paradisaea*), in collaboration with other members of the Gulf of Maine Seabird Working Group. They are exploring the patterns and causes of the abandonment of North America’s largest Arctic Tern colony in 2006. **Andre Breton** (Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, Colorado) is working with Tony to analyze the relationship of adult puffin survival to the herring stock; their paper has been accepted for publication: Breton, A.R., and A.W. Diamond. 2014. Annual survival of adult Atlantic Puffins *Fratercula arctica* varies with Herring *Clupea harengus* availability; *Ibis*, in press.

**Carina Gjerdrum** (CWS, Dart-

mouth, NS) continues to coordinate the collection of pelagic seabird data offshore from Atlantic Canada. Between (Oct 2012 and Oct 2013, over 20,000 km were surveyed on the Scotian Shelf (NS), the Grand Banks (Newfoundland and Labrador [NL]), and the Labrador Shelf (NL); they also have increased their survey effort in the eastern Arctic. In addition, this past summer, gull colonies were surveyed by air throughout coastal NS and the Bay of Fundy (on both the NS and the NB coasts) to assess the current breeding status and trends of large gulls in these provinces. Ground surveys, led by **Sabina Wilhelm** (CWS, St. John’s, NL) and **Karen Potter** (CWS, Dartmouth, NS), were conducted at a subset of colonies, in order to establish correction factors for the counts done by air, and to estimate ratios of Great Black-backed Gulls (*Larus marinus*) to Herring Gulls (*L. argentatus*).

**Rob Ronconi** (Acadia University, Wolfville, NS) worked as a Post-doc researcher with **Phil Taylor** and **Mark Mallory** (both at Acadia) investigating interactions between seabirds and offshore oil and gas platforms on the Scotian Shelf in eastern Canada. The project is a partnership between academia (Acadia), industry (**Marielle Thillet**; Encana Corporation, Halifax, NS) and government agencies (**Karel Allard** and **Carina Gjerdrum**; CWS, Sackville, NB, and Dartmouth, NS respectively). Using various devices, they tracked several different focal seabird species. On Sable Island (NS), **Rob** used VHF, satellite, and GPS archival tags to track the foraging trips and platform interactions of Herring and Great Black-backed Gulls. From Sable and Country Island (NS), MSc student **Jessica Stephens** (Acadia) used VHF tags to monitor incubation patterns and track foraging trips of Arctic and Common (*S. hirundo*) Terns. PhD student **Ingrid Pollet** (DAL, Halifax, NS) used VHF and archival geolocator tags to track Leach’s Storm-Petrel foraging trips from two NS colonies. The field team also completed a census of breeding terns and gulls on Sable Island in 2013.

### ARCTIC CANADA



Between mid-July and early-August, 2013, **Kyle Elliott** (UoM, Winnipeg, MB), **Christine Eberl** (WRD, Ottawa, ON), and **Orla Osborne** (UVIC, Victoria, BC) visited the Thick-billed Murre (*Uria lomvia*) colony at Coats Island, NU. Ice-off was late in Hudson Bay this year, and consequently, median hatch date for murres was about a week later than in recent years. Research highlights included deploying GPS loggers on about 150 murres and testing 75 known-age murres for response to experimental vaccination with Newcastle Disease vaccine. There were still at least two birds present that were banded as chicks in 1981 (and therefore 32 years old, which ties the oldest published murre records that Kyle is aware of); there were also some birds banded as adults in the late 1980s, and therefore now probably in their early 30s.

**Sarah Wong** (Acadia University, Wolfville, NS) recently began a post-doctoral fellowship with **Mark Mallory** (Acadia, NS) looking at the marine distribution of seabirds in the North American Arctic. **Sarah** is analyzing a 5-year data set of at-sea surveys conducted across western and eastern Arctic, to identify habitat associations and important marine areas. Collaborators include **Carina Gjerdrum** (CWS, Dartmouth, NS) and **Ken Morgan** (CWS, Sidney, BC).

From north to south, these are: Coronado (three islands and one islet, near the US-Mexico border), Todos Santos (two islands), San Martín, San Jerónimo, Natividad, San Roque, and Asunción. Priority seabird species for the restoration efforts include the Cassin's Auklet (*Ptychoramphus aleuticus*), Brandt's Cormorant (*Phalacrocorax penicillatus*), Double-crested Cormorant (*P. auritus*), California Brown Pelican (*Pelecanus occidentalis*), Ashy Storm-Petrel (*Oceanodroma homochroa*), and Scripps's Murrelet (*Synthliboramphus scrippsi*).

GECI's work focuses on the recolonization of these species by means of social attraction techniques: decoys and playback calls for diurnal species, and playback calls for nocturnal species. They have installed artificial nest boxes for the burrowing species. Also, they are carrying out invasive vegetation control in both Coronado and Todos Santos, and are designing a boardwalk for San Martín and San Jerónimo to avoid burrows being trampled by people walking around. As part of the environmental education program, they organized a weeklong event on Bahía Asunción for children and adults, in collaboration with the local fishermen's community (California de San Ignacio Cooperative). The main topic was seabirds on islands, and the importance of keeping islands free of invasive species. The activities included painting murals, theater, music, and biosecurity workshops.

#### CHILE

Since 2012, **Cristián G. Suazo** has published a paper describing basic biology and ecology of seabirds such as the Chilean Skua (*Stercorarius chilensis*) at islands of western Patagonia (Suazo et al., *Ornitología Neotropical*, 23: 235, 2012); and one detailing interactions between artisanal fishermen and seabirds in the southern archipelagos of Chile (Suazo et al., *Oryx*, 47: 184, 2013). The latter paper identified levels of seabird bycatch in longline fishing from reduced to null. A collaborative review synthesizing seabird bycatch and mitigation actions in Chilean waters is forthcoming.

As a member of the Albatross Task Force-Chile (ATF-Chile), **Cristián** is participating in experiments demonstrating the role of streamer lines used simultaneously with the absence of discard in reducing seabird bycatch. He is also participating in the Scientific Committee of Biodiversity-Seabirds, a group organized by the Chilean Government to share recommendations for seabird conservation, with emphasis on fishery bycatch and providing seabird identification and other training in seabird biology to scientific observers with Instituto de Fomento Pesquero (IFOP). **Cristián** has provided support and collaboration in dietary studies of nesting seabirds in Chile, such as the Black-browed and Grey-headed (*T. chrysostoma*) Albatrosses, documented major negative effects on seabird colonies of the introduction of domestic predators (e.g., dogs) on islands and islets, and the capture of Magellanic Penguins (*Spheniscus magellanicus*) for direct consumption and use as bait in the longline fishery. He has also dictated the University-level course "Seabirds: Biology, Ecology and Conservation," which had an outstanding turnout by Marine Biology students at the Universidad Católica de la Santísima Concepción.

Programs focused on conservation of the Pink-footed Shearwater (*Puffinus creatopus*) are ongoing under Oikonomos Ecosystem Knowledge, in collaboration with American Bird Conservancy (ABC), Pro Delphinus, the Corporación Nacional Forestal (Chilean federal agency), and Environment Canada. Work includes long-term conservation research, community outreach and education, and restoration programs in Chile focused on the. Current research includes breeding season monitoring, assessments of invasive predator impacts, surveys of boat captains to assess bycatch frequency in artisanal fisheries, assessments of impacts from lights in towns during the breeding season, and satellite tracking of post-breeding adults to further refine our understanding of migratory routes and wintering hotspots. Recent community activities include establishing local soccer tournaments with a shear-

## LATIN AMERICA

Compiled by **Annette Henry**

### MÉXICO—SEABIRD RESTORATION

Grupo de Ecología y Conservación de Islas, A.C. (GECI) is the recipient of the Montrose-Luckenbach Restoration Funds for seabirds in Baja California, in addition to Mexican Government funds, the in-kind collaboration of the Mexican Navy, and other private resources. **Yuri V. Albores-Barajas**, **María Félix-Lizárraga**, and **Alfonso Aguirre-Muñoz**, all with GECI, are currently working on seven groups of islands washed by the California Current.



water theme, stuffed shearwater chick workshops for schoolchildren, and the collaboration with an artists' collective to paint a shearwater mural on a wall of the community school. Restoration efforts have focused on stabilizing breeding colonies by transplanting native plants on denuded slopes that suffer from high rates of erosion. Collaborators on these projects include **Valentina Colodro**, **Peter Hodum**, **Verónica López**, **Christian López** and **Paola González** of Oikonos, **Holly Freifeld** and **George Wallace** of ABC, **Joanna Alfaro** and **Jeff Mangel** of Pro Delphinus, and **Ken Morgan** of Environment Canada.

#### ARGENTINA, GALÁPAGOS

**Dee Boersma**, with the University of Washington and the Wildlife Conservation Society, and her students are starting year 30 of the Magellanic Penguin (*Spheniscus magellanicus*) Project at Punta Tombo, Argentina. This is the largest Magellanic Penguin colony in the world. She also continues to study Galápagos Penguins (*S. mendiculus*), and to build nest sites to increase their population, in cooperation with **Godfrey Merlen** and the Galápagos National Park. A book edited by **Pablo Garcia Borboroglu** and **Dee Boersma**, "Penguins: Natural History and Conservation" was published by University of Washington Press and is available online.

## ASIA

Compiled by **Yutaka Watanuki**

Chinese Crested Tern (*Thalasseus bernsteini*) restoration at Jiushan Islands, Xiangshan County of Zhejiang Province, China, was very successful in the first year, as reported by **Simba Chan** (BLI). A workshop on tern restoration was held in March 2013. Tiedun Dao (a small island within the Jiushan Islands) was identified as the primary restoration site. About 300 decoys were placed there in early May, with the technical support of **Dan Roby** (US

Geological Survey [USGS]) his team from Oregon State University (OSU). About 20 Greater Crested Terns (*T. bergii*) were on the island the day after the audio-system was installed, and some landed on the island again in early June. About 2,600 Greater Crested Terns and a maximum of 19 Chinese Crested Terns were observed on 1 August, and some nested on the island. At least 600 Greater Crested Tern chicks were fledged from the new colony, along with at least one Chinese Crested Tern chick.

Many cooperators contributed to the Chinese Crested Tern project. **Roby's** team included **Don Lyons** and **Stefanie Collar** (OSU), who advised on tern restoration techniques and assisted with preparation of habitat and social attraction materials. **Stefanie** spent two months in China assisting with the monitoring of the restoration effort. Project leaders included **Chen Shuihua** (Zhejiang Museum of Natural History), **Simba Chan**, and officials from the Xiangshan Ocean and Fishery Bureau. The restoration project is sponsored by several international funders, including the Japan Fund for Global Environment, the U.S. Fish and Wildlife Service (Wildlife Without Borders), OSU, USGS, the Ocean Park Conservation Foundation Hong Kong, and BirdLife International supporter Mark Constantine. In China, the Xiangshan Ocean and Fishery Bureau, the Jiushan Islands National Nature Reserve, and the Zhejiang Museum of Natural History provided vital matching funds.

In Japan, **Fujii Tadashi** and his colleagues did at-sea surveys from the commercial ferry to investigate the distribution of seabirds in the Seto Inland Sea of Japan. They plan to elucidate the environmental factors affecting distribution of Arctic Loons (*Gavia arctica*), wintering Pacific loons (*G. pacifica*) and Japanese Murrelets (*Synthliboramphus wumizusume*) that may breed in the area.

At Teuri Island, Japan, **Yutaka Watanuki** (Hokkaido University) and his students monitored Rhinoceros Auklets (*Cerorhinca monocerata*), Japanese Cormorants (*Phalacrocorax capillatus*) and Black-tailed Gulls (*Larus crassiro-*

*tris*). One again the number of gulls attempting to breed was small (less than 1,000 pairs) and their success was poor. Rhinoceros Auklets started breeding 2 weeks later than average, and fledgling numbers were the lowest during 10 years of monitoring. **Kenji Hoshina** (Hokkaido University) put GPS loggers on Rhinoceros Auklets, and **Akinori Takahashi** (National Institute of Polar Research) and his students put acceleration data-loggers and geolocators. The Common Murre (*Uria aalge*) restoration program was carried out at Teuri by **Yuuji Watanabe** and **Makoto Hasebe** (Ministry of Environment) was successful, as was the control of avian predators around the breeding ledge; 8 fledglings were observed.

**Kuniko Otsuki** monitored Japanese Murrelet nests. In April–July 2013, the Japanese Murrelet Population Monitoring Team (**Yutaka Nakamura**, **Darrell Whitworth** [USA], **Kuniko Otsuki**, **Harry Carter** and **Spencer Sealy** [Canada], and others) conducted nest searches and monitored the largest known colony on Birojima, Miyazaki-ken, Japan. They were funded by the Suntory Group and assisted by town residents of Kadogawa. A total of 40 nest crevices were tagged in plots under the forest canopy on top of the island and in shoreline caves. Egg laying ranged from late February to late April. Hatching success was relatively high, but much evidence of egg and adult predation, at least some by Jungle Crows (*Corvus macrorhynchos*) and owls, was found in the forest. Fears of possible island invasion by introduced rats (*Rattus* sp.) has yet to be confirmed, but more studies are planned.

In March–April 2013, **Midori Takashima** (Kaminoseki Nature Conservation Association; KNCA), in collaboration with **Shinichi Watanabe** and his students from Fukuyama University, conducted boat surveys, nest searches, and radio-telemetry of Japanese Murrelets in the Seto Inland Sea near Kaminoseki, Yamaguchi Prefecture. Work was funded by Seven Eleven Funds, Patagonia, and Takagi Funds for Citizen Science, and this project was assisted by US scientists **John Takekawa** and

**Darrell Whitworth.** Japanese Murrelets can be found in the waters around Kaminoseki throughout the year, but to date no nests have been found on any islands in the Seto Inland Sea. As many as 11 Japanese Murrelets and 7 Ancient Murrelets (*Synthliboramphus antiquus*) were counted during boat surveys on 26–28 March. Nest searches were conducted on four islands (Uwashima, Houjiroshima, Koiwashima and Kojima), but no evidence of breeding was found. Two adult murrelets with brood patches were captured and fitted with VHF transmitters, but both murrelets apparently moved out of the study area soon after release. KNCA will continue surveys and radio telemetry in February–March 2014.

In April 2013, **Masayoshi Take-sishi** (Kitakyushu Museum of Natural and Human History) led an expedition to further evaluate the feasibility of restoring Japanese Murrelet habitat on Okinoshima and nearby Koyashima via rat eradication. Much assistance with obtaining funding and trip planning was provided by **Kuniko Otsuki**. Expedition members included: **Okabe Hiroto**, **Takuma Hashimoto**, **Gregg Howald** (Island Conservation, Canada), **Darrell Whitworth** and **Olivier Langrand** (USA), and **Bruce Fitz Earle** (Canada). Spotlight surveys in nearshore waters at night confirmed continued colony attendance by small numbers of murrelets, despite the presence of rats. Rat eradication at Okinoshima (95 ha) is feasible, but the steep cliffs (maximum elevation 254 m) necessitate the use of an aerial broadcast technique for distributing baits. The sacred nature of the island, many native and endemic plant and animal species, a large colony of Streaked Shearwaters (*Calonectris leucomelas*), and heavy use by the fishing community all require careful consideration while planning an eradication effort.

An international symposium, entitled “Japanese Murrelet and the Sea of Miracles” will be held in Yamaguchi, Kyoto, and Tokyo in August 2014.

**Rob Suryan** (OSU) continued satellite-tracking efforts on Short-tailed Albatross (*Phoebastria albatrus*). This study,

now in its twelfth year, includes collaborators at the Yamashina Institute for Ornithology (Ministry of Environment Japan) and USFWS. Current work focuses on monitoring colony attendance by hand-reared birds that were introduced to a new colony on Mukojima as chicks. We are also monitoring breeding attempts by these birds, and are analyzing and writing up satellite-tracking data from the newly fledged chicks as they went to sea.

**Michele Kappes**, **Rob Suryan**, and collaborators at the Yamashina Institute for Ornithology begun to analyze Short-tailed Albatross tracking data collected during the 2006–2008 chick-rearing period. This tracking effort was completed just as the translocation and fledgling tracking project started, so the data have not yet been fully analyzed and published.

## OCEANIA

Compiled by Yutaka Watanuki

### OCEANIA—FIJI

**Dick Watling** reported that the 2013 project on the Fiji Petrel (*Pseudobulweria macgillivrayi*) is well underway. This project employs two Moultrie® digital cameras that operate in infrared and use motion detection to capture still images of activity around burrows. Both cameras were at burrows that showed signs of activity, but no petrels were seen there. The cameras will be relocated to different burrows each week to try to determine occupancy by species.

The Fiji Petrel fledgling that grounded at the Nukuloa school in November or December 2012 provided important information on the timing of the breeding season. Petrels of similar size to Fiji Petrels have about a 6-week incubation period and a 3-month chick-rearing period. Thus, Fiji Petrel egg-laying probably occurs about mid-June to July, with hatching during August to September and fledging in November and December. Burrows of Collared Petrels (*Pterodroma brevipes*) contained medium-sized chicks that are expected to fledge at the end of July and into August. Eighty-one petrel burrows were identified in four locations of Gau Island. As of late summer

2013, 20 of these burrows were known to be occupied by Collared Petrels.

**Tuverea Tuamoto** (invasive species manager for NatureFiji–MareketiViti) accompanied a team of researchers in surveying a total of nine islands in the Lomaiviti and Lau group between 1 and 14 July 2013. The boat journey went past Gau (presumed nesting location for the Fiji Petrel) and Taveuni (presumed nesting location for Tahiti Petrel). The team surveyed for seabirds at sea for more than 50 hours, traveling over 400 nm (741 km). They recorded 26 Tahiti and 6 Collared Petrels; unfortunately, no Fiji Petrels were seen.

**Mark O'Brien** (BLI) observed Buller's Shearwaters (*Puffinus bulleri*) flying over Vanua Levu waters. Small but increasing numbers of sightings of Buller's have been recorded in recent years (3 in 2009, 2 in 2010, and 3 in 2012); this is in line with a known increasing breeding population. In May 2013 **Mark** and **Frank Hawkins** (International Union for the Conservation of Nature; IUCN) caught the ferry from Suva to Taveuni and counted a minimum of 150 of these shearwaters, all flying east just off the southern shore of Vanua Levu. A flock of about 70 birds was rafting off the Taveuni coastline at dusk as the ferry arrived. The next morning birds could be seen flying north through the gap between Vanua Levu and Taveuni toward open ocean. Similar numbers of birds were counted the next day on the return trip from Taveuni to Savusavu on Vanua Levu. The counts coincided with a large weather front to the North and West of Fiji, suggesting that birds may have deviated from their normal path to the north Pacific.

### OCEANIA—OTHER AREAS

In the Oceania region, many conservation activities are conducted by Bird-Life International (BLI) Pacific Partners. **Thomas Ghestemme** reported that in French Polynesia, between January and September 2013, Société Calédonienne d'Ornithologie (SCO) project officers rescued 128 Tahiti Petrels (*Pseudobulweria rostrata*). They had mainly been



found by locals on Tahiti. Good communication between local residents and SCO project officers played an important role in this recovery operation. Rescues involve searches for birds, then measurements and observations of handled birds. This work is accomplished mostly by volunteers, who are members of a network formed by **Lucie Faulquier**, marine bird Manager for the Société d'Ornithologie de Polynésie. SCO funded this work at the beginning of the year; grants are being sought to continue.

Other seabirds that were observed during this campaign included 3 Collared Petrels (*Pterodroma brevipes*), which are known to be breeding on the island but burrows have not been found; and 13 Audubon's Shearwaters (*Puffinus lherminieri*). Funding is also being sought to locate Collared Petrels breeding sites. Conservation of the Tahiti Petrel was carried out on Temehani, Raiatea Island (a protected area). An ongoing study there involves nest monitoring and evaluating the breeding population of Tahiti Petrels. Conservation actions such as cat (*Felis sylvestris*) and raptor control that were implemented in February have shown little success. Setbacks were identified and control efforts improved. This study is funded by the Ministry of Environment of France with support from the French Polynesia Government.

**Julien Baudat-Franceschi** reported on the Conservation of Gould's Petrel (*Pterodroma leucoptera*) in New Caledonia. The species is "vulnerable" on the IUCN Red List. It is heavily impacted by introduced predators (rats *Rattus* spp., feral cats, and pigs *Sus scrofa*), in addition to habitat destruction (bush fires and open-cast mining). Light-induced mortality is also of concern locally. The SCO and Partners implemented a program controlling these predators within a petrel breeding colony. One aim is to secure the support of stakeholders (including the South Province and mining companies) for predator control and long-term management of the Gould's Petrel colonies. An associated objective is to advocate for the conservation of this seabird, because nickel mining com-

panies are operating where most of the breeding colonies are. Mining operators are involved in the project and a management plan will be produced for mining companies to mitigate their impact. Effective rodent and cat control has been implemented in some breeding colonies, and efforts have been made to locate new breeding colonies to gain better knowledge and understanding of the Gould's Petrel breeding habitat requirements.

Conservation of Fairy Terns (*Sterna nereis*) was also carried out in New Caledonia. The Fairy Tern is globally vulnerable (IUCN Red List) and restricted to the southwest Pacific. Three subspecies are recognized: *S. n. nereis* in Australia, *S. n. davisae* in New Zealand, and *S. n. exsul* in New Caledonia and the Coral Sea. Old records and museum specimens show that this small tern was widely distributed in New Caledonia until the mid-20th century. Now, however, the population is fragmented and consists of only 100–120 breeding pairs. More than 20 small islands are known to support Fairy Tern breeding colonies, of which six were impacted by introduced rats. Between 2008 and 2010 the SCO and Partners eradicated rats from the six islets. The benefits of these operations have extended beyond Fairy Tern to all ground-nesting seabirds. On one island the near-threatened Tahiti Petrel *Pseudobulweria rostrata* has begun to re-establish, and a historical breeding site of the endangered Polynesian Storm-Petrel *Nesofregata fuliginosa* is expected to do the same. All Fairy Tern colonies are fenced and are surveyed during the breeding season. A network of protected areas for Fairy Terns and other seabirds (including the Chesterfield Islands in the Coral Sea) is being developed with local stakeholders. The next step for SCO is to push forward a Species Action Plan to be implemented by local stakeholders. Activities being planned for the next stage will encourage re-colonization of breeding colonies using decoys and improve knowledge on diet and foraging strategy.

**Sia Rasalato** from BLI summarized rat eradication projects from Suvarrow Atoll (Cook Islands). The

Pacific Secretariat of BLI, together with the Te Ipukarea Society (BLI partner) and the Cook Islands National Environment Service conducted a ground-based rat-eradication operation on Suvarrow Atoll in April and May 2013. The eradication involved the application of rat baits on three infested islands, following a well-structured program. Suvarrow is internationally recognized as an Important Bird Area that hosts eleven species of breeding seabirds; it supports regionally significant colonies of Lesser Frigatebirds (*Fregata ariel*), Red-tailed tropicbirds (*Phaethon rubricauda*) and Sooty Terns (*Onychoprion fuscatus*). The Atoll also supports a good number of Red-footed Boobies (*Sula sula*), Brown Boobies (*S. leucogaster*), Black Noddies (*Anous minutus*), and Great Frigatebirds (*F. minor*). Shorebirds such as Bristle-thighed Curlews (*Numenius tahitiensis*), Ruddy Turnstones ( *Arenaria interpres*), and Wandering Tattlers (*Tringa incana*) winter on this atoll. It will take some time until it is known if the eradication has been successful; but visitors' reports and other indications are positive. The three organizations are working together to produce and implement a biosecurity plan to prevent a re-invasion of rats to Suvarrow.

#### U.S. NATIONAL WILDLIFE REFUGES IN THE TROPICAL PACIFIC (Compiled by Annette Henry)

**Beth Flint** (U.S. Fish and Wildlife Service [USFWS], Honolulu) reports that the 2011 Palmyra rat eradication effort has been declared successful and that the vegetation, terrestrial and intertidal invertebrates, and seabirds there are all responding positively to the release from the herbivory and predation by *Rattus rattus*. Rats had shaped the ecosystem for at least the last 70 years.

In May 2012, after many years of preparation, a project to eradicate the two species of rats at Wake Atoll was finally implemented by the US Air Force, USFWS, and Island Conservation. This action was apparently successful in eliminating *Rattus tanezumi*.



They came very close to removing all *R. exulans*, but by December of 2012 it became clear that *R. exulans* survived on two of the 3 islands in the atoll. An external review of all factors in planning and implementation yielded information that will inform a second attempt, making that effort more likely to succeed and benefit the nesting seabirds at the site.

Refuge staff and volunteers at Johnston Atoll continued their systematic attempts to eradicate *Anoplolepis gracilipes* ants, which were first detected there in 2010. While the project has not achieved complete eradication yet, they have reduced the ants to levels that no longer completely preclude ground-nesting seabirds in infested areas.

Flat and declining budgets have necessitated the closure of field camps, in at least the near term, at two important seabird-monitoring sites in the Northwestern Hawaiian Islands—Laysan Island and Tern Island, in French Frigate Shoals. Long time series of data on seabird population monitoring have been interrupted at both those sites. However, staff and volunteers remain at Midway Atoll, where a study on albatross survival and the annual albatross nest count continue.

**Beth Flint** participated in the US team (**Ed Melvin**, **Mi Ae Kim**, and **Marlene Menard**) that attended the 7th meeting of the Advisory Committee of ACAP (Agreement on the Conservation of Albatrosses and Petrels) in La Rochelle, France in May 2013. She provided information about the North Pacific albatrosses, which are listed as ACAP species, at the meeting of the Population and Conservation Status Working Group, of which she is a member.

## EUROPE AND AFRICA Compiled by Steffen Oppel

### NORTH ATLANTIC AND MEDITERRANEAN

The Oxnaf group (Animal Behaviour Research Group, University of Oxford, United Kingdom [UK]) conducted seabird research on four islands of the

UK in 2013. **Akiko Shoji** and **Annette Fayett** (PhD candidates, University of Oxford), **Jennifer Roberts**, **Chris Perrins**, and project leader **Tim Guilford** (University of Oxford) visited Skomer Island, Wales. They studied migration and wintering areas of Manx Shearwaters (*Puffinus puffinus*), Atlantic Puffins (*Fratercula arctica*), Razorbills (*Alca torda*), Common Guillemots (*Uria aalge*) and Black-Legged Kittiwakes (*Rissa tridactyla*) using geolocator technology (GLS). They also deployed global positioning system (GPS) loggers and GLS to examine foraging movement of shearwaters at Skomer Island, Lundy Island (England), Lighthouse Island (Copelands, Northern Ireland), and Rum Island (Scotland). Additionally, they deployed GPS loggers and time-depth recorders to study foraging behavior of Razorbills at Skomer Island, and Black Guillemots (*Cephus grylle*) at Lighthouse Island and the Bangor marina in Northern Ireland. For the first time they deployed time-depth recorders on Atlantic Puffins as a pilot project and recovered 8 out of 12 recorders. An extremely dry summer made things easier for researchers and some seabirds, as very few chicks were found with symptoms of the disease puffinosis at Skomer Island, and Razorbills had much higher breeding success than in 2012. However, kittiwakes had a very poor year on Skomer Island. Regular ongoing monitoring (breeding success, phenology, chick-growth rates in shearwaters) was supplemented with feather sampling.

**Linda Wilson** (Joint Nature Conservation Committee) continues to work with that agency's Seabird and Cetaceans team and the four Statutory Nature Conservation Bodies. Her work will identify the most suitable marine areas to be recommended as special protected areas for the four larger tern species breeding in the UK (Arctic *Sterna paradisaea*, Common *S. hirundo*, Sandwich *S. sandicensis*, and Roseate *S. dougallii*). A habitat modelling approach is applied to establish statistical relationships of the environmental preferences of terns, using foraging location data collected via

visual tracking and transect surveys at a selection of colonies in 2009–2011, and the collated underlying environmental variables. The goal is to create a spatial surface of relative distributions both within surveyed and unsurveyed areas.

**Ellie Owen**, Royal Society for the Protection of Birds (RSPB), and the staff of the STAR project (Seabird Tracking and Research) completed a fourth year of multispecies, multisite and multi-tag-type tracking from UK seabird colonies—11 colonies in Scotland, three in England, three in Wales, and one in Northern Ireland. Over 1,500 GPS tags have now been retrieved, along with 160 TDR dive loggers (dual-deployed with GPS tags) and 65 GLS tags from five species: Black-legged Kittiwake, Northern Fulmar *Fulmarus glacialis*, Common Murre, Razorbill, and European Shag *Phalacrocorax aristotelis*. These data are being used to run habitat association models to identify and predict foraging densities of UK seabirds during the breeding season. The goal is to inform marine spatial planning, in particular marine protected areas and offshore renewable energy development.

**Falk Huettmann** (University of Alaska Fairbanks) and colleagues from the Senckenberg Institute (Frankfurt, Germany) finished a pelagic study of seabirds off Iceland in 2013. They showed a wide lack of seabirds during August 2011. Falk plans to teach with Semester at Sea ([www.semesteratsea.org](http://www.semesteratsea.org)) in fall 2014, which will allow for more seabird work in the Atlantic and its ports.

**Tim Guilford** continued research with **Rhiannon Meier** (PhD candidate, University of Southampton, Southampton, UK), **Russ Wynn** (University of Southampton), and field organizers, **Miguel McMinn** and **Anna Rodriguez**, on the at-sea and migratory behavior of the critically endangered Balearic Shearwater (*Puffinus mauretanicus*), on Mallorca and Menorca in the western Mediterranean Sea.

### SOUTH ATLANTIC

The Ascension Island Government, in collaboration with the Universities

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of Exeter (UK) and the RSBP (**Steffen Oppel** and **Mark Bolton**) tracked Masked Boobies (*Sula dactylatra*) and Ascension Frigatebirds (*Fregata aquila*) in February and September to identify offshore foraging areas. Similar tracking work was planned on neighboring St Helena, where **Steffen Oppel** and **Pete Mayhew**, in collaboration with the St Helena Government, attempted to track Masked Boobies, but found (to their surprise) that all birds had appar-

ently skipped or abandoned breeding and no birds were available to tag. Some Red-billed Tropicbirds (*Phaeton aethereus*) were tracked with GPS loggers from breeding colonies on St Helena.

The St Helena Government, in collaboration with **Steffen Oppel**, **Mark Bolton**, and **Vicki Friesen** (Queens University, Ontario, Canada) proposed to clarify the status of Band-rumped Storm-Petrels (*Oceanodroma castro*) nesting on Ascension and St Helena.

Playback trials were conducted during the cold and hot breeding seasons, confirming earlier suspicions that birds breeding in one season do not respond to calls from birds nesting in another season and may therefore be considered a separate species new to science.

**Falk Huettmann** (University of Alaska Fairbanks) is helping to co-edit the Biogeographic Atlas for Antarctica and its open access data, which will be released during 2014.

# THE LIGHTER SIDE

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## **Vending machine in Kadogawa, Miyazaki Prefecture, Japan.**

The cheerful Japanese Murrelet is advertising protection of the species, which nests on nearby Bi-rojima. In the past, residents of Kadogawa harvested murrelet eggs and adults, but now they help mitigate threats to the murrelets. The vending company, Suntory, has recently funded Japanese Murrelet monitoring.

Photo by Kuniko Otsuki; see her article on page 59 of this issue.

## **CORRECTION**

In *Pacific Seabirds* 40(1), page 27, a person was mis-named in the photo of the 2012 Executive Council. The lady on the right is Kim Rivera, not Kim Nelson. Apologies to both.



# PUBLICATIONS OF THE PACIFIC SEABIRD GROUP

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The Pacific Seabird Group publishes symposia and other works. **PSG Symposia** are occasionally held at Annual Meetings; those which have been published are listed below. **Technical Reports** prepared by PSG working groups also are listed. *To order one of these PSG publications, please see instructions after each item.*

**Abstracts** of papers and posters given at PSG meetings are published annually. Abstracts for meetings of 1974 through 1993 appeared in the *PSG Bulletin* (Volumes 2–20); for meetings of 1994 through 2003, in *Pacific Seabirds* (Volumes 21–30); and for meetings of 1997 and later, at [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

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## SYMPOSIA

**SHOREBIRDS IN MARINE ENVIRONMENTS.** Frank A. Pitelka (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Asilomar, California, January 1977. Published June 1979 in *Studies in Avian Biology*, Number 2. *Available free of charge at* <http://elibrary.unm.edu/sora/Condor/cooper/sab.php>

**TROPICAL SEABIRD BIOLOGY.** Ralph W. Schreiber (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Honolulu, Hawaii, December 1982. Published February 1984 in *Studies in Avian Biology*, Number 8. *Available free of charge at* <http://elibrary.unm.edu/sora/Condor/cooper/sab.php>

**MARINE BIRDS: THEIR FEEDING ECOLOGY AND COMMERCIAL FISHERIES RELATIONSHIPS.** David N. Nettleship, Gerald A. Sanger, and Paul F. Springer (Editors). Proceedings of an International Symposium of the Pacific Seabird Group, Seattle, Washington, January 1982. Published 1984 as Canadian Wildlife Service, Special Publication. *Out of print; available free of charge at* [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

**THE USE OF NATURAL VS. MAN-MODIFIED WETLANDS BY SHOREBIRDS AND WATERBIRDS.** R. Michael Erwin, Malcolm C. Coulter, and Howard L. Cogswell (Editors). Proceedings of an International Symposium at the first joint meeting of the Colonial Waterbird Society and the Pacific Seabird Group, San Francisco, California, December 1985. *Colonial Waterbirds* 9(2), 1986. \$12.00. *Order from:* Ornithological Societies of North America, PO Box 1897, Lawrence, Kansas 66044; phone (800) 627-0629; no online orders.

**ECOLOGY AND BEHAVIOR OF GULLS.** Judith L. Hand, William E. Southern, and Kees Vermeer (Editors). Proceedings of an International Symposium of the Colonial Waterbird Society and the Pacific Seabird Group, San Francisco, California, December 1985. Published June 1987 in *Studies in Avian Biology*, Number 10. \$18.50. *Available free of charge at* <http://elibrary.unm.edu/sora/Condor/cooper/sab.php>

**AUKS AT SEA.** Spencer G. Sealy (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published December 1990 in *Studies in Avian Biology*, Number 14. *Available free of charge at* <http://elibrary.unm.edu/sora/Condor/cooper/sab.php>

**STATUS AND CONSERVATION OF THE MARBLED MURRELET IN NORTH AMERICA.** Harry R. Carter, and Michael L. Morrison (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published October 1992 in *Proceedings of the Western Foundation of Vertebrate Zoology*, Volume 5, Number 1. \$20.00. *Order from PSG Treasurer* (order form on last page), *or available free of charge at* [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

**THE STATUS, ECOLOGY, AND CONSERVATION OF MARINE BIRDS OF THE NORTH PACIFIC.** Kees Vermeer, Kenneth T. Briggs, Ken H. Morgan, and Douglas Siegel-Causey (editors). Proceedings of a Symposium of the Pacific Seabird

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Group, Canadian Wildlife Service, and the British Columbia Ministry of Environment, Lands and Parks, Victoria, British Columbia, February 1990. Published 1993 as a Canadian Wildlife Service Special Publication, Catalog Number CW66-124-1993E. **Order free of charge from:** Publications Division, Canadian Wildlife Service, Ottawa, Ontario, K1A 0H3, Canada.

**BIOLOGY OF MARBLED MURRELETS—INLAND AND AT SEA.** S. Kim Nelson and Spencer G. Sealy (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Seattle, Washington, February 1993. Published 1995 in *Northwestern Naturalist*, Volume 76, Number 1. \$12.00. **Order from PSG Treasurer** (order form on last page), **or available free of charge at** [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

**BEHAVIOUR AND ECOLOGY OF THE SEA DUCKS.** Ian Goudie, Margaret R. Petersen and Gregory J. Robertson (editors). Proceedings of the Pacific Seabird Group Symposium, Victoria, British Columbia, 8-12 November 1995. A special publication compiled by the Canadian Wildlife Service for the Pacific Seabird Group. Published 1999 as Canadian Wildlife Service Occasional Paper number 100, catalog number CW69-1/100E. **Order free of charge from:** Publications Division, Canadian Wildlife Service, Ottawa, Ontario, K1A 0H3, Canada, **or available free of charge at** [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

**SEABIRD BYCATCH: TRENDS, ROADBLOCKS AND SOLUTIONS.** Edward F. Melvin and Julia K. Parrish (editors). Proceedings of an International Symposium of the Pacific Seabird Group, Blaine, Washington, 26-27 February 1999. Published 2001 by University of Alaska Sea Grant, Fairbanks, Alaska. Publication no. AK-SG-01-01. \$40.00. **Order from publisher.**

**BIOLOGY, STATUS, AND CONSERVATION OF JAPANESE SEABIRDS.** Nariko Oka (editor). Proceedings of an International Symposium of the Japanese Seabird Group and Pacific Seabird Group, Lihue, Hawaii, February 2001. *Journal of the Yamashina Institute of Ornithology* 33(2); Symposium (5 papers), pp 57-147, other papers pp. 148-213. In English with Japanese abstracts. \$75.00. **Order from PSG Treasurer** (order form on last page).

**OIL AND CALIFORNIA'S SEABIRDS.** Harry R. Carter (convener) and Anthony J. Gaston (editor). Proceedings of a Symposium of the Pacific Seabird Group, Santa Barbara, California, February 2002. Published 2003 in *Marine Ornithology* 31(1). **Available free of charge at** [www.marineornithology.org](http://www.marineornithology.org)

**THE BIOLOGY AND CONSERVATION OF THE AMERICAN WHITE PELICAN.** Daniel W. Anderson, D. Tommy King, and John Coulson (editors). Proceedings of a Symposium of the Pacific Seabird Group. *Waterbirds*, Volume 28. Special Publication 1, 2005. Published by the Waterbird Society. \$15.00. **Order from PSG Treasurer** (order form on last page).

**BIOLOGY AND CONSERVATION OF XANTUS'S MURRELET.** Harry R. Carter, Spencer G. Sealy, Esther E. Burkett, and John F. Piatt (editors). Proceedings of a symposium of the Pacific Seabird Group, Portland, Oregon, January 2005. Published 2005 in *Marine Ornithology* 33(2):81-159. **Available free of charge at** [www.marineornithology.org](http://www.marineornithology.org)

**SEABIRDS AS INDICATORS OF MARINE ECOSYSTEMS.** John F. Piatt and William J. Sydeman (editors). Proceedings of an International Symposium of the Pacific Seabird Group, Girdwood, Alaska, February 2006. Published 2007 in *Marine Ecology Progress Series* Volume 352:199-309. **Available free of charge at** <http://www.int-res.com/abstracts/meps/v352/#theme>

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## TECHNICAL PUBLICATIONS

**EXXON VALDEZ OIL SPILL SEABIRD RESTORATION WORKSHOP.** Kenneth I. Warheit, Craig S. Harrison, and George J. Divoky (editors). Exxon Valdez Restoration Project Final Report, Restoration Project 95038. PSG Technical Publication Number 1. 1997. **Available free of charge at** [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

**METHODS FOR SURVEYING MARBLED MURRELETS IN FORESTS: A REVISED PROTOCOL FOR LAND MANAGEMENT AND RESEARCH.** Pacific Seabird Group, Marbled Murrelet Technical Committee. PSG Technical Publication Number 2. 2003. **Available free of charge at** [www.pacificseabirdgroup.org](http://www.pacificseabirdgroup.org)

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